

CLIMATE ACTION & ADAPTATION PLAN

For the City of St. Louis Sustainability Plan

City of St. Louis, Missouri



V.1.1



Apotheosis of St. Louis in Forest Park



Climate Action & Adaptation Plan for the City of St. Louis

From Mayor Francis G. Slay



I am pleased to propose the first Climate Action & Adaptation Plan for the City of St. Louis. I view these climate protection recommendations as an important next step on the City's journey toward creating a healthy, sustainable and equitable future. In developing the City of St. Louis Sustainability Plan, hundreds of citizens, community groups and City department representatives charted a sustainable course forward. Since its 2013 adoption by the Planning Commission, the City of St. Louis Sustainability Plan has served as a robust library of ideas and best practices. Several new sustainability initiatives have been launched and strategies implemented. As a City, we should be proud of those accomplishments in making St. Louis a more sustainable place to live, work, learn and play.

This document, a Climate Action & Adaptation Plan for the City of St. Louis, takes the Sustainability Plan objectives on climate protection to the next stage. Like the Sustainability Plan, this climate planning document builds on existing efforts and is intended to accentuate the City's unique character, assets and opportunities. The condition of our local climate is inextricably linked to the health of the people who live in the City, and the quality of life to be enjoyed by current and future generations. We must find ways to reduce our greenhouse gas emissions and prepare and adapt for the future in a resilient manner. This Climate Action & Adaptation Plan outlines in detail the strategies that will be required to achieve an 80% reduction in citywide greenhouse gas emissions by 2050.

Implementation of the measures outlined in this plan will take community leadership, vision and everyone working together. For the sake of our children and our planet, we must go beyond staying the course and reach new heights. My hope is this plan will serve as inspiration and direction, and be utilized as a climate protection planning tool. It will take effort, but working together we can create an equitable, healthy and climate resilient city.

A handwritten signature in black ink that reads "Francis G. Slay". The signature is fluid and cursive, with a slightly larger "F" at the beginning.

Francis G. Slay
Mayor, City of St. Louis

April 2017





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Maryland Plaza in the Central West End

GOOD PUBLIC TRANSIT
SAFE STREETS AND NEIGHBORHOODS
RECYCLING AND COMPOSTING
STRONG PUBLIC SCHOOLS
LIVING WAGE JOBS

WALKABLE GREEN SPACE
PARKS
CLEAN
BIKE FRIENDLY

PEDESTRIAN FRIENDLY
LOCALLY PRODUCED FOOD
AFFORDABLE HOUSING
ECONOMIC OPPORTUNITY
VIBRANT
DENSELY POPULATED
ARCHITECTURAL PRESERVATION
GROWTH
HEALTHY
PUBLIC AWARNESS
ENERGY EFFICIENT
INNOVATIVE
LIVABLE PROGRESSIVE

RENEWABLE ENERGY SOURCES
TREES
PLANNING AND BUILDING FOR FUTURE
COLLABORATIVE
URBAN GARDENS

Word cloud generated from the City of St. Louis Sustainability Planning process



Climate Action & Adaptation Plan for the City of St. Louis

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INTRODUCTION & OVERVIEW: CONTEXT OF CLIMATE PROTECTION IN THE CITY

Introduction

All cities and their residents will be increasingly impacted by climate change in the coming decades. At the most general scale, climate change will affect the food we eat, the water we drink, the air we breathe, the place we live, and the weather we experience. Climate change will at some point impact every person's health and home. The impact of climate change is already being experienced by some people within the City of St. Louis, such as increased summer temperature and more frequent, longer heat waves. Worsening air quality and increased airborne allergens often impact the most vulnerable the greatest. Increased extreme weather –such as heavy precipitation, flooding, droughts, and storms– threaten human health and safety, and often creating severe financial repercussions. It is well accepted that the impact of climate change will be greater on those residents living in distressed neighborhoods. Therefore, the impact of climate change is likely to have a significant effect on both the current and future generations, in terms of public health and safety of residents, as well as the local economy. The challenges associated with climate change also present opportunities to grow the green economy and create jobs. The St. Louis Green Jobs Report revealed that half of all companies surveyed agree that “the growth of the green economy presents opportunities for growth for [their company].”¹

At the local level, cities have the ability to address climate impacts and adapt to impacts, such as temperature increases, so that the city remains safe and livable with the least disruption for all. It is more costly to postpone climate action than it is to take immediate and incremental actions to mitigate its impacts. Studies have found that costs increase with the length of delay, and the more ambitious the climate target, the greater the cost of delay.² As such, addressing climate change through mitigation and adaptation strategies is a prudent approach to investing in a more green, healthy, inclusive and sustainable City of St. Louis.

The climate action and adaptation recommendations of this document propose to advance equity, protect valuable assets, and improve people’s health and well-being in ways that support improved quality of life, prosperity and community vibrancy.

Climate Action & Adaptation Planning in the City of St. Louis

The Climate Action & Adaptation Plan for the City of St. Louis emanates from the City of St. Louis Sustainability Plan and Mayor Slay's Sustainability Action Agenda. The City of St. Louis Sustainability Plan was formally adopted by the City Planning Commission in January 2013. In February 2013, Mayor Francis G. Slay announced his Mayor's Sustainability Action Agenda. It contains 29 priority sustainability initiatives for implementation by 2018. Included within the Action Agenda was a priority to support Citywide greenhouse gas emissions reductions of 25% by 2020 and 80% by 2050.

Mayor Slay subsequently made a commitment to the Compact of Mayors in November 2015. The Compact of Mayors pledge outlines a series of steps for a municipality to take to measure, assess, evaluate and plan its climate responses. The Compact of Mayors sets a three year period in which to complete these steps. The creation of the 2015 Greenhouse Gas (GHG) Emissions Inventory, identification of potential climate related hazards, setting a reduction target, and developing a Climate Action & Adaptation Plan will satisfy most of the Compact of Mayors expectations. This document has been prepared to advance the conversation on climate protection in the City, and to comply with the expectations of the Compact of Mayors pledge.

1. St. Louis Green Jobs Report, 2011, page 2.
2. Furman, Jason, What is the Cost of Delaying Climate Action?, <https://www.weforum.org/agenda/2015/02/what-is-the-cost-of-delaying-climate-action/>, date accessed: 2 February 2017.

Climate Protection Planning Process

In 2016, the City issued a Request for Proposals for a consultant to develop a Climate Action & Adaptation Plan. The selection committee chose H3 Studio and Rene Dulle as the consultant team to lead development of a Climate Action & Adaptation Plan that would provide direction to implement the climate protection strategies from the City of St. Louis Sustainability Plan and Mayor's Sustainability Action Agenda. The City's Sustainability Director worked closely with the consultant team during Fall 2016/Winter 2017, and ensured that the consultant team was given input and information by representatives of City departments and technical experts in the community. This document is not an adopted plan, but is a recommendation from the Mayor's Office of Sustainability for climate protection activities going forward.

The Climate Action & Adaptation Planning process was developed to align with and build upon existing efforts by both City government and the entire community. To begin the planning process, the consultant conducted a review of relevant plans, policies, ordinances, programs and initiatives from the City of St. Louis and utility companies. The GHG Emissions Inventories for calendar years 2005, 2010, 2013, and 2015 were reviewed to identify trends and opportunities to be considered for mitigation planning efforts (GHG Emissions Inventories are presented in more detail on pages 14 & 15). Climate hazards were identified to begin the adaptation planning efforts (climate hazards are presented in more detail on page 17). To further inform the planning process, the consultant conducted interviews with key staff and stakeholders possessing particular technical knowledge and expertise regarding climate change in the City of St. Louis.

After gathering necessary information, the consultant created GHG Emissions Reduction Scenario Models to determine the path forward for mitigation planning, to demonstrate what it would take to reach the 80% by 2050 reduction target (see page 16 for more information). Mitigation measures were developed as part of the reduction scenario modeling process. These reduction scenario models, with supporting mitigation and adaptation measures, were presented to key City staff and technical experts in the community for review and feedback. The Climate Action & Adaptation Plan developed for the Mayor's Office of Sustainability is a culmination of the thorough climate protection planning process.

City of St. Louis Efforts Leading to Climate Action & Adaptation Planning



2005

Mayor Francis Slay signed the US Conference of Mayors Climate Protection Agreement in 2005 to reduce GHG emissions 7% from 1990 levels by 2012.



2009

An Energy Efficiency and Conservation Block Grant (EECBG) of \$3.7 million was awarded to the City of St. Louis in 2009 to be used for energy efficiency activities. Funds were used to start Set the PACE St. Louis, Energy Saving St. Louis CFL distribution program, & many more sustainable initiatives



2013

The City of St. Louis Sustainability Plan was formally adopted by the City Planning Commission in January 2013, and the Mayor's Sustainability Action Agenda was released in February 2013 identifying priority action items for implementation from the Sustainability Plan.



2015

Mayor Francis Slay committed to the Compact of Mayors climate agreement in November 2015.

Evaluating GHG Emissions Reduction Targets

The overall recommended climate target is to achieve an 80% GHG emissions reduction by 2050 from 2005 baseline levels. The first section of this document outlines recommended mitigation measures to take in order to reach that target. Additionally, this document serves as a climate adaptation framework. The second section of this document outlines recommended adaptation measures that will help make the City more resilient to climate change.

The initial decision to pursue the aggressive reduction target of 25% by 2020 for the City of St. Louis was set in a number of contexts. The Missouri Renewable Energy Standard (RES), passed in 2008, was set to increase the proportion of electricity generated by renewable energy sources to 15% by 2021. Ameren UE, the primary electricity provider for the City, currently produces 71% of its electricity from coal burning power plants and only 1% from renewable energy sources.³ However, Ameren's 2014 Integrated Resource Plan (IRP) shows that by 2020 Ameren Missouri will only achieve approximately 5% renewable energy under the RES by 2020, because the amount of renewable energy acquired under the RES is constrained by the law's 1% limit on associated customer rate impacts.⁴ The City has put forth a great effort to work towards meeting the 25% by 2020 reduction goal; however, because of these various factors that have limited renewable energy progress in the City, there is no realistically achievable path for meeting such an aggressive target. This Plan will focus on reducing GHG emissions 80% by 2050, which is still aggressive, but also achievable.

Mitigation & Adaptation Goals

Implementation of the measures outlined in this Climate Action & Adaptation Plan will provide an opportunity to improve public health and the quality of life in the City of St. Louis. Per the City of St. Louis Sustainability Plan, climate action planning is triple bottom line in scope, balancing environmental, social and economic considerations, needs, and opportunities within the City. This Climate Action & Adaptation Plan is designed to fulfill two overarching climate-related goals, as explained below.

- **Mitigation Goal: Build a Healthy, Prosperous & Low-Carbon City**

Mitigation efforts are intended to guide greenhouse gas emissions reductions to reach the target of 80% by 2050 (from a baseline of 2005). Climate action provides an opportunity to reduce air pollution from GHG emissions to improve air quality. The mitigation section of the document contains five (5) objectives, each containing a number of strategies and actions intended to guide greenhouse gas mitigation efforts. These recommendations focus on improving the built environment, natural environment, and infrastructure to improve public health, economic prosperity, and community empowerment within the City of St. Louis.

- **Adaptation Goal: Build a Strong, Equitable & Climate Resilient City**

Adaptation efforts help establish and build climate resilience in response to climate change. This section of the document contains three (3) objectives, each containing a number of strategies and actions intended to guide adaptation efforts. These adaptation recommendations focus on building resilience to climate hazards to protect human health and safety, preserve ecology and biodiversity, reduce the impacts of climate change on vulnerable populations, and ensure equitable protection of people in severe weather events.

3. Sierra Club, A Bright Future: Moving from Coal to Clean Energy in the St. Louis Region, 2016, page 2.
4. Ameren Missouri, 2014 Integrated Resource Plan, 2014.

Triple Bottom Line Co-Benefits of Climate Protection

Social Benefits: Climate action and adaptation implementation often result in improved community vibrancy. The protection and restoration of natural systems provides a valuable public amenity that can be beneficial to health and well-being. Developing efficient and equitable transportation options empowers the community through increased access to jobs, education, and healthcare, while reducing pollution from vehicle emissions. Improved building energy efficiency and cleaner sources of energy production will greatly reduce air pollution and the associated negative health impacts. See page 13 for more information on the public health risks of climate change, and how they can be improved through climate protection implementation.

Economic Benefits: Energy efficiency is the largest sector within the U.S. clean energy economy.⁵ Businesses located in the City of St. Louis currently employ 1,845 people in energy efficiency jobs, and 2016 market trends revealed a 13% growth rate nationwide.⁶ The solar industry has shown substantial job growth nationwide, and is growing nearly 20 times faster than the overall economy.⁷ Ameren's dependence on coal raised rates 43% between 2009 and 2014.⁸ Climate action implementation presents an opportunity to grow the clean energy economy to create jobs, reduce utility costs for homes and businesses, and protect against the rising cost of coal dependent energy.

Environmental Benefits: A quality natural environment serves as a major asset to urban areas. Protecting natural resources, such as land, water, plants, and animals, from the harmful effects of climate change will help maintain a high quality of life with clean water, green trees, fresh food, and clean air to breathe. The existing urban tree canopy (UTC) in the City of St. Louis is 7,237 acres (18.2%), with the potential of increasing by 13,479 acres (33.9%).⁹ The UTC in the City of St. Louis and portions of the county are valued at more than \$72 million for the ecosystem services it provides.¹⁰

Cross Cutting Outcomes of Climate Action & Adaptation Implementation

 Social	 Environmental	 Economic
<ul style="list-style-type: none">◦ Mobility & access to transportation◦ Affordable housing◦ Education & training opportunities◦ Food access and nutrition◦ Active living, health & well-being◦ Crime reduction & safety improvements◦ Quality of life & neighborhood vitality◦ Social equity & cultural diversity	<ul style="list-style-type: none">◦ Aesthetic / Beautification◦ Flood mitigation / Stormwater control◦ Heat island mitigation◦ Improved air quality◦ Improved water quality◦ Expanded tree canopy, green space & ecosystem services◦ Biodiversity & native species◦ Water conservation	<ul style="list-style-type: none">◦ Green job opportunities◦ Home or building investment◦ Neighborhood Development or improvement◦ Land Use & Transportation Integration◦ Local business innovation & Entrepreneurship◦ Reduced energy costs to tenants & building owners◦ Reduced maintenance & repair costs◦ Technology and innovation opportunities

5. Environmental Entrepreneurs (E2), Energy Efficiency Jobs in America: A Comprehensive Analysis of Energy Efficiency Employment Across All 50 States, 2016, page 3.
6. Environmental Entrepreneurs (E2), Energy Efficiency Jobs in America: A Comprehensive Analysis of Energy Efficiency Employment Across All 50 States, 2016, page 71.
7. Sierra Club, A Bright Future: Moving from Coal to Clean Energy in the St. Louis Region, 2016, page 7.
8. Sierra Club, A Bright Future: Moving from Coal to Clean Energy in the St. Louis Region, 2016, page 9.
9. Hanou, Ian, St. Louis, Missouri Urban Tree Canopy (UTC) Assessment, 2010, page 2
10. Forest ReLeaf of Missouri, St. Louis Urban Canopy Assessment, 2012, page 4.



Citygarden

Invest In Public Health

Climate change has an adverse effect on public health, and is a major reason to implement the climate action and adaptation recommendations in this Plan. Climate change is expected to create a number of adverse public health conditions, including the increased risk of contracting infectious diseases, exposure to heat stress, air pollution, and allergens, as well as negative impacts on mental health.¹¹

Temperatures will continue to rise and extreme heat events will become the new normal. Higher temperatures will increase heat stress, the number one killer in the United States.¹² Temperatures over 90 degrees Fahrenheit increase ground level ozone, a major component in smog, which negatively impacts air quality. Coal-burning power plants cause damaging air pollution that exacerbates asthma and other respiratory diseases, which can lead to heart attacks, lung problems, and premature mortality. Asthma is the number one reason for hospitalizations of children at St. Louis Children's Hospital.¹³ Climate action and adaptation implementation can help mitigate air pollution, and reduce the health implications of climate change and improve quality of life.

The dangerous effects of climate change disproportionately affect vulnerable populations, such as the elderly and children, as well as people in low-income communities and African American communities, “where residents confront daily the symptoms of historic inequities.”¹⁴ During extreme heat events, people in poverty often cannot afford to turn on the air conditioning or improve their homes with better insulation, which increases their risk of heat stroke or even mortality. Disadvantaged communities typically have less green space and tree cover to shade their community and reduce heat island effects. Air quality in St. Louis is one of the nation’s poorest, making air unhealthy and increasing asthma rates in the City, especially for African American children. Climate protection will reduce the negative effects of climate change on vulnerable people and improve their health and well-being.



St. Louis Children's Hospital

11. Green, Jared, We Can't Ignore the Health Impacts of Climate Change, <https://dirt.asla.org/2017/02/21/we-cant-ignore-the-health-impacts-of-climate-change-part-2/>, date accessed: 2 February 2017.

12. Ibid

13. Sierra Club, A Bright Future: Moving from Coal to Clean Energy in the St. Louis Region, 2016, page 17.

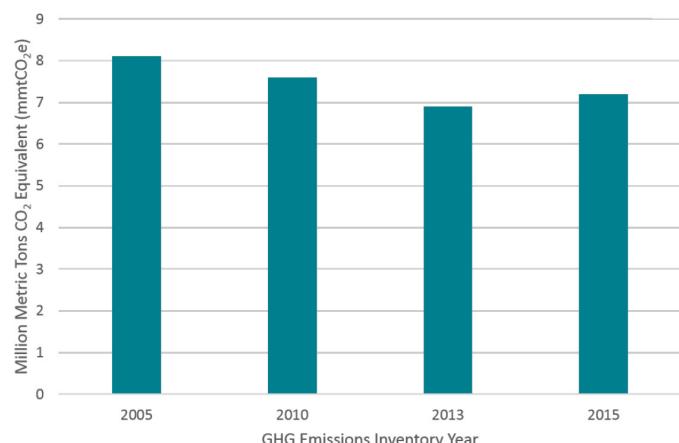
14. Kelly, Cathleen, Resilient Midwestern Cities Improving Equity in a Changing Climate, 2016, page 1.

City Of St. Louis Community GHG Emissions Inventory

A greenhouse gas (GHG) emissions inventory is a tool to identify and measure where emissions originate, establishing historical emission trends and tracking progress in reducing greenhouse gases. The Community GHG Emissions Inventory measures GHG emissions generated by the entire community within the political boundaries of the City of St. Louis, including government operations of the City of St. Louis. **In 2015, the entire community was responsible for the GHG emissions of 7.2 million metric tons of carbon dioxide equivalent (mmtCO₂e).** This is an 11% reduction (-862,248 mtCO₂e) from the 2005 baseline year for measuring GHG emissions reductions.

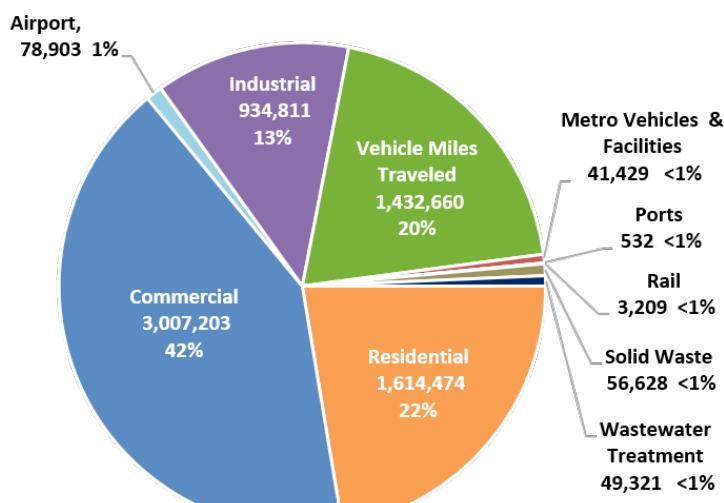
The method for completing the community inventories followed the ICLEI *Global Protocol for Community-Scale GHG Emissions Inventories: An Accounting & Reporting Standard for Cities*. The City retained Rene Dulle as a contractor to use this protocol to conduct GHG inventories for both 2013 and 2015. The GHG emissions were generated by sources within eleven sectors of the community: commercial buildings, residential buildings, industrial facilities, vehicle miles traveled, solid waste, wastewater treatment & facilities, Metro vehicles & facilities, airport, rail, and ports.

Community GHG Emissions Reduction Trends 2005-2015



Between 2005 and 2015 the Community reduced GHG emissions 11% (-862,248 mtCO₂e). Between 2013 and 2015, however, GHG emissions increased 3% (+301,244 mtCO₂e). The sectors with the greatest increase in GHG emissions were vehicle miles traveled, commercial buildings, and industrial facilities; combined these sectors increased +280,306 mtCO₂e. The reason for this increase is currently unclear, but it could be correlated to an uptick in commercial activity in the City.

City of St. Louis 2015 Community GHG Emissions Inventory



Total 2015 = 7,219,170 mtCO₂e *all quantities in mtCO₂e

The City of St. Louis 2015 Community GHG Emissions Inventory revealed that 97% of community-wide GHG emissions came from sources within the built environment (commercial, residential, and industrial sectors) and vehicles miles traveled. Structures within the existing built environment generated 77% of GHG emissions, and vehicle miles traveled generated 20%.

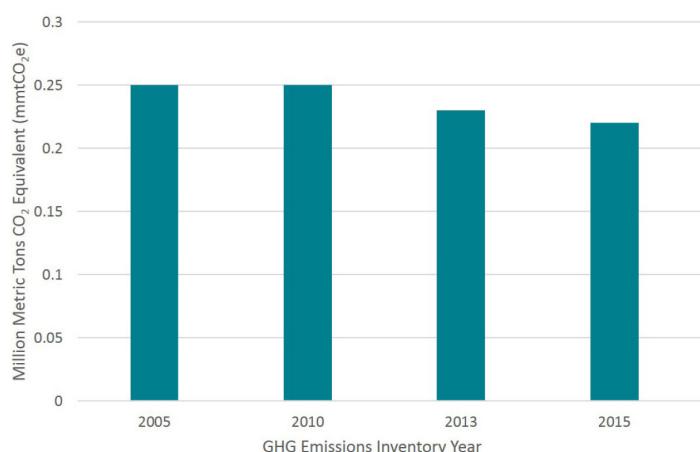
City of St. Louis Government GHG Emissions Inventory

Municipal, also referred to as Government, GHG emissions are a subset of the overall Community GHG emissions. In 2015, St. Louis City Government sources created 222,537 metric tons carbon dioxide equivalent (mtCO₂e). This represents approximately 3% of overall community GHG emissions. Municipal GHGs are evaluated separately because City Government has direct control over its operations, whereas it aspires to guide and influence community emissions through encouragement and policy.

It is important to note that the City Government has been working to reduce its GHG emissions, and successful results are reflected in Government GHG Inventories, showing an 11% reduction from 2005 levels, -27,147 mtCO₂e. City of St. Louis efforts to advance climate action and adaptation efforts are highlighted in the *City Leading By Example* sections throughout this document.

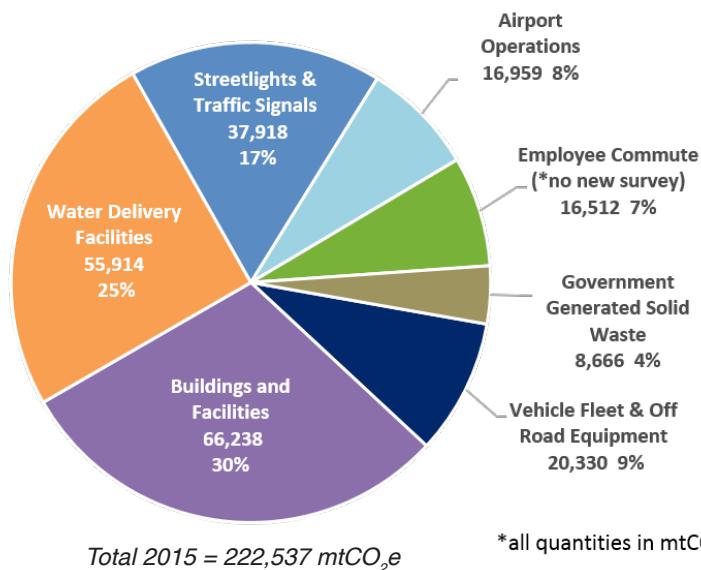
The emissions of the Government GHG Emissions Inventory were generated by sources within 7 sectors of local government control: buildings & facilities, street lights & traffic signals, airport operations, water delivery facilities, vehicle fleet & off road equipment, employee commute, and government generated solid waste.

Government GHG Emissions Reduction Trends 2005-2015



Between 2005 and 2015 the Government reduced emissions 11% (-27,147 mtCO₂e). The sectors that have shown the greatest decrease in emissions from 2005 to 2015 are Street Lights & Traffic Signals (-11,405 mtCO₂e), Water Delivery Facilities (-10,262 mtCO₂e), and Buildings and Facilities (7,112 mtCO₂e).

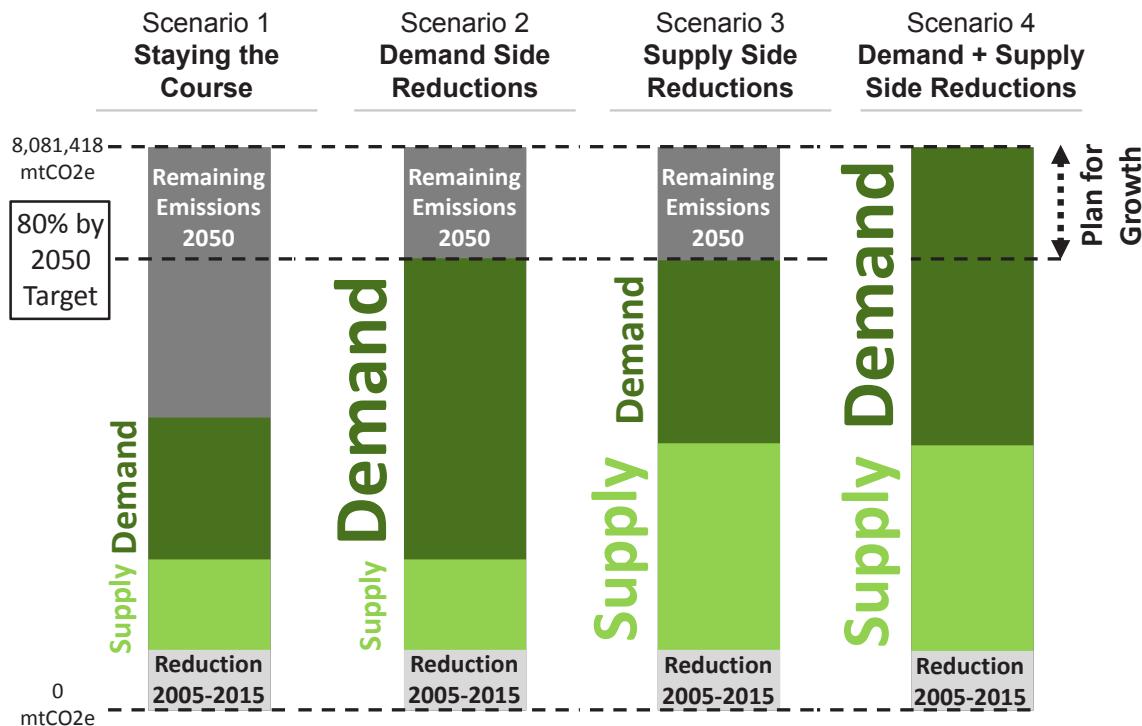
City of St. Louis 2015 Government GHG Emissions Inventory



The City of St. Louis 2015 Government GHG Emissions Inventory revealed that 30% of emissions were generated from Buildings & Facilities and 25% from Water Delivery Facilities. Street Lights & Traffic Signals are responsible for 17% of emissions, and Vehicle Fleet & Off Road Equipment for 9%.

Note: Although Lambert St. Louis International Airport is located in St. Louis County, it is operated by the St. Louis Airport Authority, which is majority controlled by officials from the City of St. Louis. As such, portions of emissions from the Airport are included within both the Government and Community GHG inventories.

GHG Emissions Reduction Scenario Models



The four (4) GHG Emissions Reduction Scenario Models are explained in detail below:

- 1. Staying the Course:** This model represents the GHG emissions reduction potential if all plans, programs, and initiatives currently taking place today continued at the same rate until 2050.
- 2. Demand Side Reduction Strategies:** Demand side refers to action taken to reduce fuel consumption. This model requires aggressive local government, community, and individual action for implementation to achieve the 2050 target.
- 3. Supply Side Reduction Strategies:** Supply side refers to action taken by the energy supplier to reduce greenhouse gas emissions at the source. This model requires an aggressive carbon intensity reduction of the electricity source through a change in state policy and aggressive action by the utility provider to increase their clean energy portfolio to achieve the 2050 target. This model would require moderate action from the demand side.
- 4. Demand + Supply Side Reduction Strategies:** This would require that aggressive action be taken by both the supply side and the demand side to reach the 2050 target and allow room for population and Gross Domestic Product (GDP) growth.

The four (4) GHG Emission Reduction Scenarios were modeled with a flat line population and GDP growth for the future, because the future is uncertain and cannot be predicted. Scenario 2 and 3 achieve the 2050 target; however, if business or population growth were to occur in the City, GHG emissions could increase and prevent the City from reaching its 2050 target. The fourth model combines the most aggressive Demand Side and Supply Side measures in an effort to offset future GDP and population growth. This GHG emission reduction model was chosen for development in the mitigation portion of this plan because the City hopes for healthy growth over the next 35 years. The City should evaluate and scale mitigation efforts to appropriately offset growth.

Information from the U.S. Energy Information Administration (EIA) Annual Energy Outlook 2016 was used for carbon intensity projection modeling and takes into consideration the following sources: Energy Policy Act of 2005 (EPACT2005), Energy Improvement and Extension Act of 2008 (EIEA2008), American Recovery and Reinvestment Act of 2009 (ARRA2009), Corporate Average Fuel Economy (CAFE) Standards, Greenhouse Gas Emissions Standards, Heavy-Duty Vehicle Fuel Consumption, and Biofuel consumption. These reflect requirements enacted by NHTSA and the EPA, as well as provisions in the Energy Independence and Security Act of 2007 (EISA2007).

Compact of Mayors Climate Hazards Identification

As part of the City's commitment to the Compact of Mayors, an assessment of risks associated with climate hazards was prepared by staff of the East-West Gateway Council of Governments. Following guidance from the Compact of Mayors and utilizing weather data, the climate hazards were rated for probability of occurring. Next, a technical advisory group was assembled to rate the consequence of each hazard, should it occur. Below is the resulting list of climate hazards that have been identified as having a higher probability of occurring in the City of St. Louis.

Temperature Extremes

- **Extreme Hot Days / Heat Waves**

The City is predicted to experience more days over 90 and 100 degrees Fahrenheit and longer lasting/hotter heat waves.

- **Extreme Winter Conditions / Cold Wave**

Overall winters are expected to be milder; however, cold snaps and cold waves will occur.

- **Vector-borne Disease**

Warmer temperatures globally will increase the geographic range and season length for disease carrying insects.

- **Insect Infestation**

Temperatures affect insect reproduction and mortality. Warmer temperatures can lead to increased insect populations and migration.

Precipitation Extremes

- **Rainstorm**

Heavy rainfall events are predicted to increase in frequency. The Spring season will see the greatest increase.

- **River flood**

The City's proximity to the confluence of the Missouri and Mississippi Rivers increase the City's vulnerabilities to river flooding during rain events.

- **Flash / Surface Flood**

Increased heavy precipitation will lead to more frequent flash flooding and surface flooding caused by stormwater runoff and sewer overflows.

- **Hail / Heavy Snow**

Changing weather patterns and cold snaps will result in hail and heavy snow events.

- **Waterborne Disease**

Severe precipitation events can lead to outbreaks of waterborne diseases.

- **Drought**

Short-term droughts are projected to increase with hotter temperatures evaporating moisture from soil & plants.

Severe Weather / Natural Disaster

- **Tornado / Severe Wind**

Strong storms are more likely with increased warming, which could increase the frequency of tornadoes due to the temperature patterns associated with climate change.

- **Earthquake**

The City of St. Louis is located near the New Madrid Seismic Zone. Although earthquakes are not directly related to climate change they create a great risk for the City.

- **Lightning / Thunderstorm**

More intense thunderstorms and lightning events may increase with global warming.



Summary of Goals, Objectives & Strategies

MITIGATION GOAL: BUILD A HEALTHY PROSPEROUS & LOW-CARBON CITY

OBJECTIVES	STRATEGIES	PAGES
1. Build an Energy Efficient City	<i>1.1 Measure Progress & Equity in Climate Action Planning 1.2 Retrofit & Renovate Existing Built Environment for Energy Savings 1.3 Make Green Building the Standard Practice 1.4 Make Energy Efficiency Measures Affordable</i>	31-39
2. Accelerate Clean Renewable Energy	<i>2.1 Provide Cleaner More Efficient Energy Sources 2.2 Advance Community Scale Renewable Energy Options & Utilization</i>	40-45
3. Create Equitable Access to Inter-Modal Transportation	<i>3.1 Integrate Land Use & Transportation for Healthy, Compact Development 3.2 Reduce Congestion & Vehicle Emissions 3.3 Support Alternative Fuel Vehicles 3.4 Facilitate Alternative Commutes</i>	46-55
4. Support Community Well-Being	<i>4.1 Empower the Community for a Prosperous Green Economy 4.2 Create Vibrant Neighborhoods that Advance Public Health & Safety</i>	56-61
5. Protect Natural Resources & Greenspaces	<i>5.1 Restore & Regenerate Natural Systems as Carbon Sinks 5.2 Improve Water Efficiency 5.3 Reduce Waste & Consumption</i>	62-69

ADAPTATION GOAL: BUILD A STRONG, EQUITABLE & CLIMATE RESILIENT CITY

OBJECTIVES	STRATEGIES	PAGES
1. Preserve & Enhance the Natural Environment	<i>1.1 Improve & Restore Natural Systems for Changed Conditions</i>	78-81
2. Protect Human Health & Safety	<i>2.1 Protect People from Temperature Extremes 2.2 Create a Healthy & Cool Built Environment 2.3 Reduce Flood Impact & Risk</i>	82-89
3. Maximize Preparedness Efforts	<i>3.1 Prepare for Natural Disaster</i>	90-93

MITIGATION GOAL: BUILD A HEALTHY, PROSPEROUS & LOW-CARBON CITY

Objective 1: **BUILD AN ENERGY EFFICIENT CITY**

Objective 2: **ACCELERATE CLEAN RENEWABLE ENERGY**

Objective 3: **CREATE EQUITABLE ACCESS TO INTER-MODAL TRANSPORTATION**

Objective 4: **SUPPORT COMMUNITY WELL-BEING**

Objective 5: **PROMOTE NATURAL RESOURCES & GREENSPACES**

Building energy consumption in the commercial, residential, and industrial sectors **and Vehicle Miles Traveled, combined, account for 97% of St. Louis Community GHG emissions**, that is 6,989,148 mtCO₂e.

When categorized by fuel source, **59% of GHG emissions were from electricity consumption** (2015 Community GHG Emission Inventory)



Background on Climate Mitigation in the City

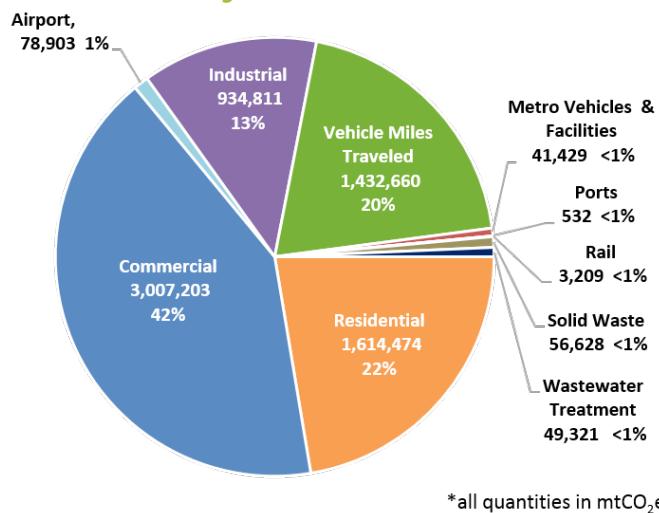
Community GHG Emissions Inventories

In 2015, the City of St. Louis community was responsible for the emission of 7.2 mmtCO₂e (million metric tons of carbon dioxide equivalent). This is an 11% reduction from the 2005 community inventory.

The vast majority of GHG emissions, approximately 97%, are generated by structures in the existing built environment and vehicle miles traveled. The built environment accounts for 77% of GHG emissions and includes the combined energy consumptions of buildings and their operations in the commercial, residential and industrial sectors. Vehicles starting or stopping in the City of St. Louis, using gasoline or diesel, are responsible for 20% of GHG emissions. The fuel source of these emissions comes primarily from electricity consumption within the Community, which is the cause for nearly 60% of all GHG emissions.

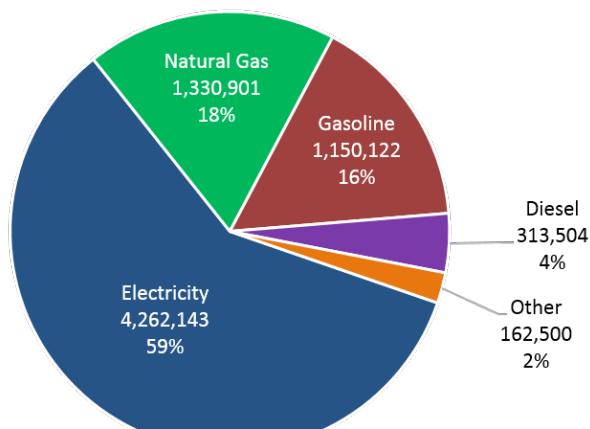
The 2015 Community GHG Emissions Inventory reveals opportunities for deep GHG emission reductions from the built environment, vehicle miles traveled, and the method of electricity production, which is primarily from coal-burning power plants.

City of St. Louis 2015 Community GHG Emissions Inventory



The 2015 Community GHG Inventory measures emissions from sectors including commercial buildings, residential buildings, industrial facilities, vehicle miles traveled, solid waste, wastewater treatment & facilities, metro vehicles & facilities, rail, ports, and airport. Lambert St. Louis International Airport is located in St. Louis County, but is operated by the St. Louis Airport Authority, which is majority controlled by officials from the City of St. Louis; therefore, some airport GHGs have been separated out for inventory purposes.

City of St. Louis 2015 Community GHG Emissions Inventory From Fuel Source



The City of St. Louis 2015 Community GHG Emissions Inventory, categorized by fuel source, shows GHG emissions from the consumption of electricity, natural gas, gasoline, diesel, and other fuels, which include propane, steam, distillate fuel oil, kerosene, residual fuel, and compressed natural gas (CNG).

Total GHG Emissions Community 2015 = 7,219,170 mtCO₂e

Target Setting & GHG Emissions Reductions

In 2005, Mayor Francis Slay signed the US Conference of Mayors Climate Protection Agreement to reduce GHG emissions 7% below 1990 levels by 2012. The City achieved this goal and has set new goals for the future. On November 13, 2015, Mayor Francis Slay signed the Compact of Mayors. This pledge requires GHG emission reduction target setting and the development of a plan to address mitigation of GHG emissions. Through the Compact of Mayors, **Mayor Slay proposed that the community set a target to reduce GHG emissions 80% by 2050 from the baseline year of 2005.** This document reflects the recommendation of the Mayor's Office that the City officially commit to achieving this target going forward, and outlines measures to take to achieve the target.

In 2005, Community GHG emissions in the City of St. Louis totaled approximately 8.1 mmtCO₂e. To reach the 80% by 2050 goal, 6.5 mmtCO₂e will have to be reduced from 2005 to 2050. There has been an 11% GHG emission reduction (-862,248 metric tons CO₂e) city-wide from 2005 to 2015. As a result, **the Community will have to reduce GHG emissions an additional 5.6 mmtCO₂e from 2015 to 2050 to meet the 80% by 2050 target** (assuming emissions do not increase in that time frame).

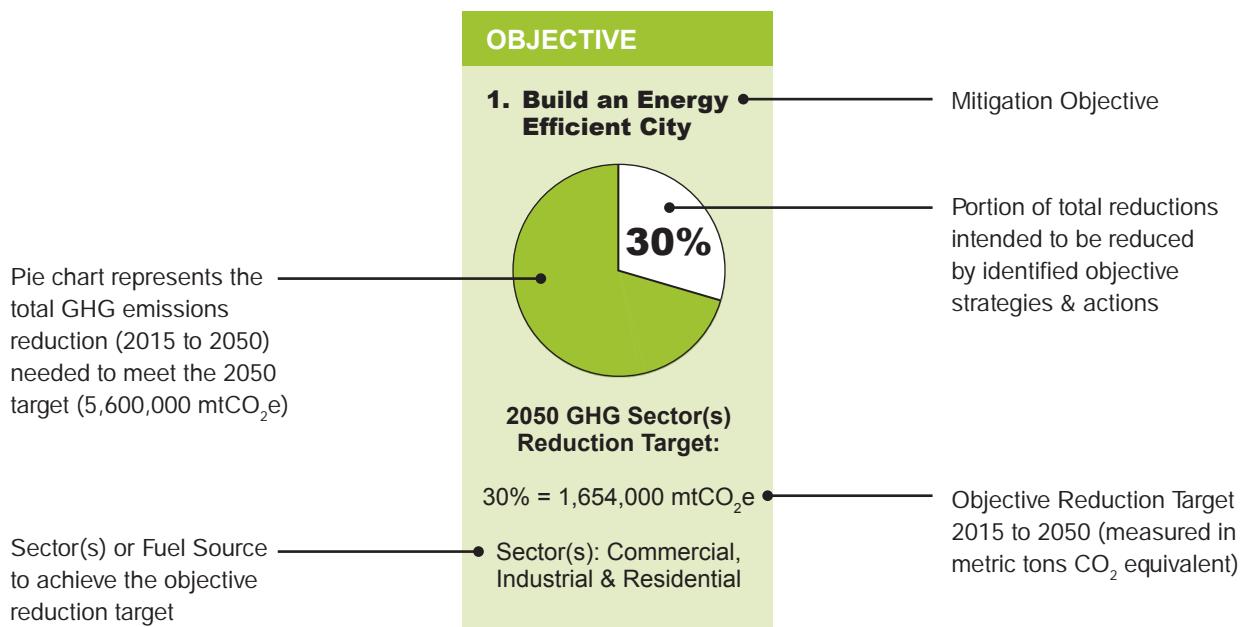
The City of St. Louis 2015 Community GHG Emissions Inventory shows an overall reduction of 11% from 2005 to 2015. However, between 2013 and 2015 GHG emissions have slightly increased. The reason for this increase is currently unclear, but it could be correlated to an uptick in commercial activity in the City. As the community works toward achieving the 2050 target of 80% GHG emissions reduction, the City aspires to population and GDP growth over the next 35 years. It is important to be cognizant of long term growth goals while working to achieve deep GHG emissions reductions.

This section of the Plan is intended to guide mitigation efforts to help the community achieve an 80% GHG emission reduction by 2050 (from 2005 baseline levels). Within the mitigation section there are five (5) objectives, that each contain strategies and actions intended to guide mitigation efforts in order to achieve the 2050 reduction target. The GHG emission reduction potential of each action will depend on the level of implementation, to be determined above and beyond this planning effort. The *Objective Reduction Targets* are not official targets, simply goals created to guide the community toward deep GHG emissions reductions.



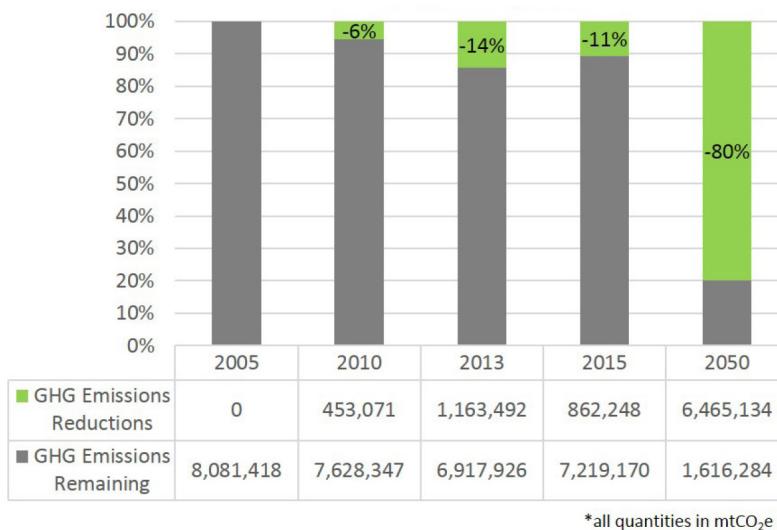
Milkweeds for Monarchs wildlife habitat at City Hall

Objective Reduction Target Structure



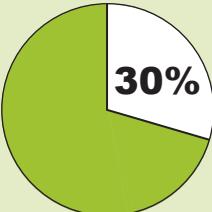
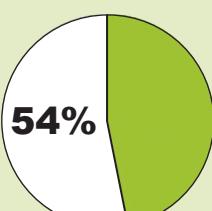
Explained above is the Objective Reduction Target Structure used to set targets throughout the mitigation section. Four (4) of the five (5) mitigation objectives have objective reduction targets (not official targets) to guide mitigation efforts.

Community GHG Emissions Reductions 2005-2015 And 80% by 2050 Target Reductions



This graph shows the GHG emissions reductions from 2005 (baseline year) for 2010, 2013 and 2015 and the amount of GHG emissions reductions required to meet the 80% by 2050 target.

Table: Mitigation Goal: Objectives, Strategies, and Actions Overview

Objectives	Strategies & Actions
1. Build an Energy Efficient City  <p>30%</p>	<p>1.1 Measure Progress & Equity in Climate Action Planning</p> <ul style="list-style-type: none"> • Create a monitoring and implementation system for greenhouse gas reductions to track progress • Develop an energy efficiency equity index for use by the City in climate action planning efforts <p>1.2 Retrofit & Renovate Existing Built Environment for Energy Savings</p> <ul style="list-style-type: none"> • Complete LED Street Lighting Program • Aggressively pursue voluntary and expand mandatory benchmarking • Implement a Tenant Energy Optimization Program • Utilize Energy Star Challenge • Encourage residential, commercial & industrial cool roof installations • Encourage residential, commercial & industrial green roof installations • Achieve retro-commissioning and deep retrofits for commercial & industrial buildings <p>1.3 Make Green Building the Standard Practice</p> <ul style="list-style-type: none"> • Continue the Municipal Energy Efficiency & LEED Standards Ordinances • Develop a tiered system for energy reduction in new construction linked to public incentive programs • Offer incentives for green building practices • Create Zero-Net Energy (ZNE) incentive program for residential, commercial & industrial new construction • Adopt the most current IECC building code as written • Adopt a rating and disclosure policy for sale of homes and minimum compliance through the energy code <p>1.4 Make Energy Efficiency Measures Affordable</p> <ul style="list-style-type: none"> • Aggressively market and expand energy efficiency rebate programs offered by utilities • Substantially expand funding for weatherization assistance program • Expand residential energy efficiency financing initiatives • Implement a no-cost energy assessment for residential buildings • Establish an energy concierge service to assist building owners and operators to take advantage of existing energy efficiency resources • Coordinate with benchmarking program and expand use of Set the PACE St. Louis to finance energy saving projects • Revive Energy Saving St. Louis CFL distribution
2. Accelerate Clean Renewable Energy  <p>54%</p>	<p>2.1 Provide Cleaner More Efficient Energy Sources</p> <ul style="list-style-type: none"> • Expand Combined Heat and Power (CHP) capabilities within the City • Allow clean energy from the Grain Belt Express Clean Line • Continuously increase the percentage of renewable energy sources • Improve existing power plants' efficiency by updating newer & replacing outdated coal-fired power plants with renewable sources • Reduce carbon emissions from coal-fired power plants • Promote microgrid installations powered by renewable resources • Increase Renewable Portfolio Standards (RPS) per Missouri Clean Energy Act <p>2.2 Advance Community Scale Renewable Energy Options & Utilization</p> <ul style="list-style-type: none"> • Develop policy and initiatives to support solar installations • Permit, market & implement comprehensive solar installation program • Support community solar policies & projects to bring clean, sustainable power to all residents & businesses

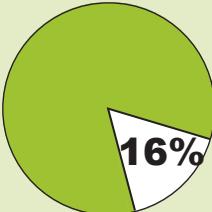
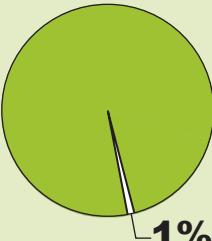
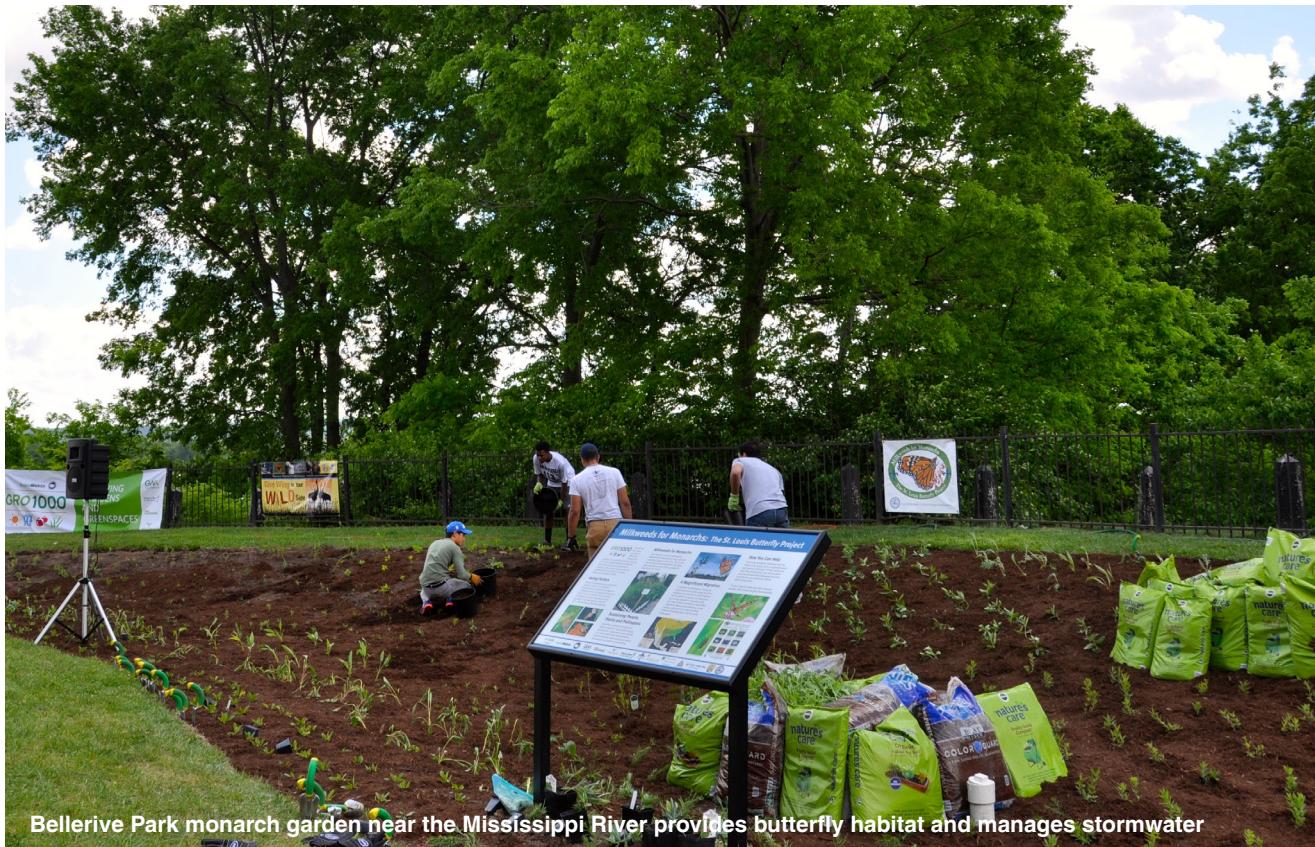
OBJECTIVES	STRATEGIES & ACTIONS
3. Create Equitable Access to Inter-Modal Transportation  <p>16%</p>	<p>3.1 Integrate Land Use & Transportation for Healthy, Compact Development</p> <ul style="list-style-type: none"> Develop incentive program for reduced parking and eliminate parking code minimums Create a smart transit, parking, and bike system Expand public transit infrastructure with supporting transit oriented development Develop additional form-based codes to support transit oriented development (TOD) and mixed land and building uses <p>3.2 Reduce Congestion & Vehicle Emissions</p> <ul style="list-style-type: none"> Expand opportunities for telecommuting and compressed work weeks Leverage Congestion Mitigation Air Quality (CMAQ) funding to improve traffic flows Utilize occupancy sensors and sync traffic signals to reduce vehicle idling & improve traffic flows Develop monitoring and enforcement of anti-idling ordinance Encourage implementation of anti-idling and telematics technologies and exhaust retrofits on vehicles Study Congestion Mitigation Strategies <p>3.3 Support Alternative Fuel Vehicles</p> <ul style="list-style-type: none"> Develop infrastructure for the cost-effective use of electric vehicles Ensure electric vehicle charging stations are solar powered Incentivize the use of electric vehicles for private fleets <p>3.4 Facilitate Alternative Commutes</p> <ul style="list-style-type: none"> Complete North South MetroLink Expansion Plans Expand employer incentives for ride-share, car-share, use of transit, and cycling Aggressively market and expand Metro's Commuter Advantage Program Design bike-ped infrastructure that supports highly-used walking and cycling paths Implement equitable bike share program Continue Complete Street Ordinance
4. Support Community Well-Being <p>Supporting Measures No GHG Emissions Reduction Target</p>	<p>4.1 Empower the Community for a Prosperous Green Economy</p> <ul style="list-style-type: none"> Continue and expand existing job programs to include green jobs training & opportunities Expand access to services and high quality affordable housing through mixed use development Develop a comprehensive community education and outreach energy reduction program Conduct ongoing networking and education programs for community engagement focused on sustainability <p>4.2 Create Vibrant Neighborhoods that Advance Public Health & Safety</p> <ul style="list-style-type: none"> Start an initiative to "Build Healthy Communities" Utilize Crime Prevention Through Environmental Design (CPTED) practices Develop healthy, safe environments that improve public health

Table continues on next page. See next page for objective 5.

Table: Mitigation Goal: Objectives, Strategies, and Actions Overview

OBJECTIVES	STRATEGIES & ACTIONS
5. Protect Natural Resources & Greenspaces  <p>1%</p>	<p>5.1 Restore & Regenerate Natural Systems as Carbon Sinks</p> <ul style="list-style-type: none"> • Increase tree canopy for biological sequestration • Develop new urban forests and ecological restoration areas as carbon sinks • Minimize removal of trees and landscape biomass to reduce CO₂ in the atmosphere • Continue to naturalize the public and private landscapes to create carbon biomass storage • Encourage restoration or reconstruction of wetland areas along all rivers and streams to absorb carbon
	<p>5.2 Improve Water Efficiency</p> <ul style="list-style-type: none"> • Continue improvements to the aging water infrastructure to reduce water loss during distribution • Reduce water consumption through installation of low-flow fixtures • Educate community on water saving behavior • Ensure all buildings are metered • Adopt low-flow/regulated sprinkler and irrigation guidelines • Utilize rainwater capture and reuse methods and practices • Utilize Set the PACE St. Louis Program to finance water saving projects
	<p>5.3 Reduce Waste & Consumption</p> <ul style="list-style-type: none"> • Develop a plan for aggressive waste diversion • Expand composting services to include the collection of food waste • Adopt a construction & demolition waste diversion program with incentives

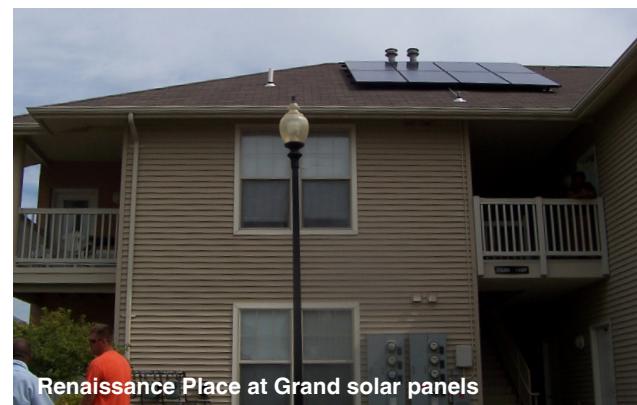




CITY OF ST. LOUIS LEADING BY EXAMPLE

Affordable Housing Commission

The Affordable Housing Commission (AHC) of the City of St. Louis is dedicated to improving energy efficiency in the built environment and advancing equitable green building practices. Implementation of the Sustainability Plan and upgrading units to improve energy efficiency are two priorities for projects to receive Affordable Housing Trust Fund (AHTF) money. Additionally, the AHC requires that all new construction projects build to a national green building standard, and apply for Laclede Gas High Efficiency Program Rebates and Ameren Missouri Energy Efficiency Rebates and Incentives to receive funding. McCormack Baron Salazar used funding from the Affordable Housing Commission and Community Development Administration (CDA) to install solar panels at Renaissance Place and Senior Living at Cambridge Heights, two sustainable mixed-income developments in the City. Combined, these solar arrays (249.7 kW in size) produce 337,096 kWh of electricity annually, thereby reducing demand on the electrical grid and lowering operating expenses for the development.





RELATIONSHIP TO EXISTING PLANS, PROGRAMS, AND INITIATIVES

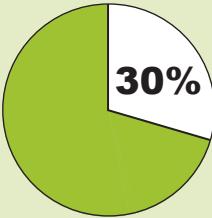
RELATIONSHIP KEY	SUSTAINABILITY PLAN	PROGRAMS & INITIATIVES	CITY, REGIONAL, & OTHER PLANS
● Direct Impact ○ Secondary Impact ○ Indirect Impact X Relationship to Plan	Urban Character, Vitality & Ecology Arts, Culture & Innovation Empowerment, Diversity & Equity Health, Well-Being & Safety Infrastructure, Facilities & Transportation Education, Training & Leadership Prosperity, Opportunity & Empowerment	City Energy Project City of St. Louis Sustainable Neighborhood Initiative City of St. Louis Vitality & Ecology Initiative St. Louis Green Business Challenge Energy Saving St. Louis (inactive) Mississippi River Cities & Towns Initiative MSD – Project Clear Project Connect SetthePACE St. Louis	Ameren – Integrated Resource Plan (IRP) City of St. Louis P.I.E.R. Plan City of St. Louis Resiliency Plan (in development) City of St. Louis Sustainability Plan Community Health Improvement Plan (CHIP) Community Health Needs Assessment (CHA) EMS Report – Lambert-St. Louis International Airport Great Rivers Greenway District Gateway Bike Plan Missouri Comprehensive State Energy Plan MSD – Sanitary Sewer Overflow Control Master Plan OneSTL Regional Plan for Sustainable Development State of Missouri Technical Reference Manual St. Louis Regional Hazard Mitigation Plan St. Louis Regional YYP Task Force Community Plan
1. Build an Energy Efficient City			
1.1 Measure Progress & Equity in Climate Action Planning	○ ○ ○ ● ○ ● ○ ○	- X - X - - - - -	- X - X - - - - - X - - -
1.2 Retrofit & Renovate Existing Built Environment for Energy Savings	○ ○ ○ ● ● ○ ●	X X - X X - - - - X	X - - X - - X - X - X X - -
1.3 Make Green Building the Standard Practice	○ ○ ○ ● ● ○ ○	X - - X - - - - X	- - - X - - - - X - X X - -
1.4 Make Energy Efficiency Measures Affordable	○ ○ ● ○ ○ ○ ○	X X - X X - - - - X	X - - X - - - - X - X X - -

MITIGATION OBJECTIVE 1

BUILD AN ENERGY EFFICIENT CITY

Existing buildings throughout the City of St. Louis consume the largest amount of energy, and are collectively responsible for 77% of community greenhouse gas emissions, primarily from the consumption of electricity and natural gas. Improving the energy efficiency of commercial, industrial, and residential buildings will provide an opportunity to greatly reduce community-wide greenhouse gas emissions. The demand for electricity can be reduced through energy benchmarking, behavioral changes, weatherization, and retrofits of buildings.

To reach an 80% reduction of emissions by 2050, it is recommended that there be a combined sector target of 30% GHG emissions reduction from the commercial, industrial, and residential building sectors. The strategies and actions in this section are intended to help guide the community toward achieving the 30% sector reduction target in the built environment. Reducing energy consumption in the built environment has positive social, environmental, and economic benefits, such as improved air quality and public health, reduced utility costs, and improved neighborhood vitality and quality of life.

OBJECTIVE	STRATEGIES & ACTIONS
<p>1. Build an Energy Efficient City</p>  <p>30%</p> <p>2050 GHG Sector(s) Reduction Target: 30% = 1,654,000 mtCO₂e Sectors: Commercial, Industrial & Residential</p>	<p>1.1 Measure Progress & Equity in Climate Action Planning</p> <ul style="list-style-type: none">• Create a monitoring and implementation system for greenhouse gas reductions to track progress• Develop an energy efficiency equity index for use by the City in climate action planning efforts <p>1.2 Retrofit & Renovate Existing Built Environment for Energy Savings</p> <ul style="list-style-type: none">• Complete LED Street Lighting Program• Aggressively pursue voluntary and expand mandatory benchmarking• Implement a Tenant Energy Optimization Program• Utilize Energy Star Challenge• Encourage residential, commercial & industrial cool roof installations• Encourage residential, commercial & industrial green roof installations• Achieve retro-commissioning and deep retrofits for commercial & industrial buildings <p>1.3 Make Green Building the Standard Practice</p> <ul style="list-style-type: none">• Continue the Municipal Energy Efficiency & LEED Standards Ordinances• Develop a tiered system for energy reduction in new construction linked to public incentive programs• Offer incentives for green building practices• Create Zero-Net Energy (ZNE) incentive program for residential, commercial & industrial new construction• Adopt the most current IECC building code as written• Adopt a rating and disclosure policy for sale of homes and minimum compliance through the energy code <p>1.4 Make Energy Efficiency Measures Affordable</p> <ul style="list-style-type: none">• Aggressively market and expand energy efficiency rebate programs offered by utilities• Substantially expand funding for weatherization assistance program• Expand residential energy efficiency financing initiatives• Implement a no-cost energy assessment for residential buildings• Establish an energy concierge service to assist building owners and operators to take advantage of existing energy efficiency resources• Coordinate with benchmarking program and expand use of Set the PACE St. Louis to finance energy saving projects• Revive Energy Saving St. Louis CFL distribution

Strategy 1.1: Measure Progress & Equity in Climate Action Planning

Developing methods and systems to measure progress will help ensure climate action planning efforts are successful at reducing GHG, cost-effective and equitable. Plans should be vetted through a community engagement process to determine the needs and challenges facing implementation and to ensure climate action planning efforts have social, economic, and environmental benefits.

Benefits: Inclusive and comprehensive community involvement will help the City achieve its GHG reduction goals by educating and empowering the community to take climate action.

Challenges: Determine who will monitor climate action implementation to ensure cost effectiveness and equity, and create a monitoring system.



CROSS CUTTING OUTCOMES

Social

- Education & training opportunities
- Quality of life & neighborhood vitality
- Social equity & cultural diversity

Environmental

- Heat island mitigation
- Improved air quality

Economic

- Green job opportunities
- Local business innovation & Entrepreneurship
- Technology and innovation opportunities

CITY OF ST. LOUIS LEADING BY EXAMPLE

City Energy Project & Energy Benchmarking Ordinance

The City of St. Louis was recently chosen to join the City Energy Project, a national initiative to support building energy efficiency. In conjunction with this effort, Mayor Slay signed an Energy Benchmarking Ordinance requiring annual benchmarking and transparency of building energy consumption for buildings larger than 50,000 square feet. With technical support and funding from the City Energy Project, the City of St. Louis is in the process of hiring a new technical energy advisor to assist building owners with benchmarking efforts, and connect them with tools to reduce energy use and save money.

Mitigation Objective 1: Build an Energy Efficient City

STRATEGY 1.1

Measure Progress & Equity in Climate Action Planning

ACTIONS

Create a monitoring and implementation system for greenhouse gas reductions to track progress

Develop a detailed plan for implementation of mitigation actions and monitor implementation by tracking progress. Energy benchmarking is a tool that can be leveraged to track and understand GHG reductions. It is essential to measure air quality, greenhouse gas emissions, building energy savings through energy benchmarking, and the level of participation in related incentives, initiatives, and programs. Tracking and quantifying these factors can help guide implementation and measure progress.

Develop an energy efficiency equity index for use by the City in climate action planning efforts

Utilize data to measure investment potential in climate action planning efforts to further equity in the City. Engage the public to determine needs and challenges to implementation of mitigation strategies and actions. Create a system for measuring climate action planning benefits for all members of the community. Consider establishing a Climate Action Planning Equity Advisory Committee to lead this effort.



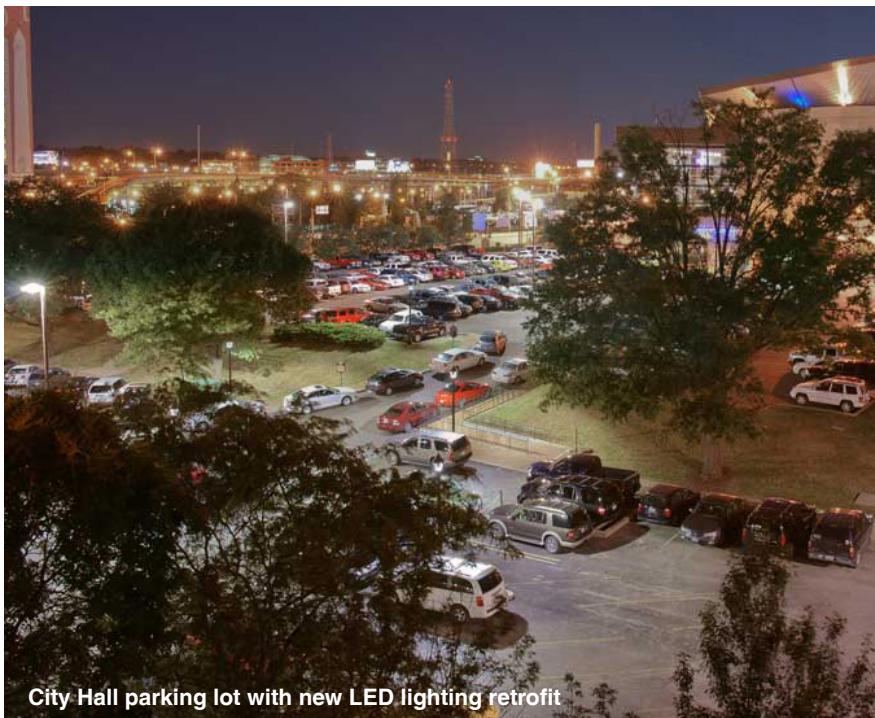
Community members participate in the City's Sustainability Planning process

Strategy 1.2: Retrofit & Renovate Existing Built Environment for Energy Savings

The built environment, primarily buildings and their operations, generate 77% of greenhouse gas emissions in the City of St. Louis from the residential, commercial, and industrial sectors. To achieve deep greenhouse gas emissions reductions, it is critical to address the energy efficiency of existing buildings. The City of St. Louis has a significant amount of historic and aging structures, which present opportunities for retrofitting for higher performance.

Benefits: Investing in building energy efficiency can increase property values, lower maintenance costs and utility bills, reduce energy demand and the risk of rising energy prices, and provide a more comfortable and healthier indoor environment. Tracking building energy use through energy audits and benchmarking efforts is key for energy saving success.

Challenges: Capital resources or financing for retrofits, and achieving widespread energy benchmarking.



CROSS CUTTING OUTCOMES



Social

- Education & training opportunities
- Food access and nutrition
- Active living, health & well-being
- Quality of life & neighborhood vitality
- Social equity & cultural diversity



Environmental

- Aesthetic / Beautification
- Flood mitigation / Stormwater control
- Heat island mitigation
- Improved air quality
- Expanded tree canopy, green space & ecosystem services



Economic

- Green job opportunities
- Home or building investment
- Neighborhood Development or improvement
- Local business innovation & Entrepreneurship
- Reduced energy costs to tenants & building owners
- Reduced maintenance & repair costs
- Technology and innovation opportunities

CITY OF ST. LOUIS LEADING BY EXAMPLE

Energy Audits and Retrofits of Municipal Buildings

The City of St. Louis Facilities Management Division has completed (5) five major retrofit energy saving projects at City Hall and the Carnahan Courthouse. Altogether, the City of St. Louis may realize a total annual utility savings of \$376,200 from the combined retrofits. The City Hall general parking lot lighting was retrofitted to LED post lighting resulting in an 85% reduction in electrical usage and increasing the overall brightness of the parking areas from one foot-candle to three foot-candles, greatly enhancing visual night time security around City Hall. Facilities Management will continue to conduct ongoing energy audits on all municipal buildings as well as explore viable renewable energy options.

STRATEGY 1.2

Retrofit & Renovate Existing Built Environment for Energy Savings

ACTIONS	
Complete LED Street Lighting Program	Complete plans to invest in upgrading the City's network of street lights from yellow high pressure sodium street lights to new, LED street lights. LEDs are more energy efficient, brighter and last more than a decade, saving money on light replacement. LED lights improve safety by better illuminating the streets and sidewalks, and providing better lighting conditions for capturing clearer security camera footage.
Aggressively pursue voluntary and expand mandatory benchmarking	Scale up benchmarking efforts to allow building owners, operators, and managers to assess the performance of existing buildings' energy consumption and compare the results to other buildings or applicable standards. An Energy Star challenge can further encourage benchmarking and energy saving.
Implement a Tenant Energy Optimization Program	Introduce a program that integrates energy efficiency into tenant space design. Encourage and recognize efficiency in tenant spaces to further support this effort. (See ULI Tenant Energy Optimization Program: http://tenantenergy.ulic.org/)
Utilize Energy Star Challenge	Encourage and recognize efficiency in buildings by encouraging commercial and industrial buildings to participate in Energy Star challenges to save energy and reduce GHG emissions. (See Energy Star Program: https://www.energystar.gov/buildings)
Encourage residential, commercial & industrial cool roof installations	Launch a campaign or challenge to promote white/cool roof installations in order to mitigate urban heat island effects, improve building energy efficiency, reduce utility bills, and increase the life of air-conditioning systems.
Encourage residential, commercial & industrial green roof installations	Green roofs improve building energy efficiency by providing shade and insulation. Additionally, green roofs reduce peak stormwater runoff and potentially grow food.
Achieve retro-commissioning and deep retrofits for commercial & industrial buildings	Utility providers can offer incentives for these significant energy saving upgrades by following a simple dollar per kWh or Therm-installed method based on verified energy savings. The utility provider can set an energy savings threshold for projects to qualify for additional incentives to encourage building owners to pursue a greater level of energy saving upgrades. PACE can finance these upgrades.

Strategy 1.3: Make Green Building the Standard Practice

The City invites economic development and aspires to have population growth over the next 35 years. However, new development in the City would increase energy consumption leading to an increase in greenhouse gas emissions community-wide. Green building practices must become the standard for new construction and major renovation projects in the City to offset the effects of economic and population growth on greenhouse gas emissions.

Benefits: Green buildings tend to appeal to tenants, increase property values, lower operating costs, and provide an overall healthier environment through improved air quality. Growing the City's green building stock may attract new businesses that place a premium on these and related amenities.

Challenges: Competition from the region will require the City to stay competitive with incentives and bonuses to attract new green building development.



Bio-Retention in the CORTEX Innovation District

CROSS CUTTING OUTCOMES



Social

- Affordable housing
- Education & training opportunities
- Active living, health & well-being
- Quality of life & neighborhood vitality
- Social equity & cultural diversity



Environmental

- Flood mitigation / Stormwater control
- Heat island mitigation
- Improved air quality
- Improved water quality
- Water conservation



Economic

- Green job opportunities
- Home or building investment
- Neighborhood Development or improvement
- Local business innovation & Entrepreneurship
- Reduced energy costs to tenants & building owners
- Reduced maintenance & repair costs
- Technology and innovation opportunities

CITY OF ST. LOUIS LEADING BY EXAMPLE

Cortex Innovation District Low Impact Development

The CORTEX Innovation District is a nationally significant hub of bioscience and technology research. The City of St. Louis plays an important role in CORTEX to make it a priority effort in the City. The CORTEX development values the environment and utilized sustainable development practices, including a number of LEED buildings and best management practices for stormwater runoff. For example, the @4240 building received a platinum LEED rating and has multiple rain gardens to absorb rain water on-site.

Sustainability Impact Statement for Development Incentives

St. Louis Development Corporation (SLDC) requires new development receiving public incentives to submit a Sustainability Impact Statement explaining the ways in which the development plans conform to the City's adopted Sustainability Plan. This key sustainability initiative can be built upon to incorporate green building requirements for development incentives.

Mitigation Objective 1: Build an Energy Efficient City

STRATEGY 1.3

Make Green Building the Standard Practice

ACTIONS	
Continue the Municipal Energy Efficiency & LEED Standards Ordinances	Continue to implement the City government's sustainability policies, including the Municipal Energy Efficiency and LEED Standards Ordinances, which require energy saving design for new construction and major renovations
Develop a tiered system for energy reduction in new construction linked to public incentive programs	Develop requirements for new construction projects receiving public incentives to meet or exceed a determined energy performance level, based on the amount of public incentives being used for the project. (See Pittsburgh: http://www.pittsburghpa.gov/green/buildings.htm)
Offer incentives for green building practices	Encourage green building practices through rewards such as additional density bonuses or expedited permitting processes. Rewarding green building techniques makes the option more attractive to developers.
Create Zero-Net Energy (ZNE) incentive program for residential, commercial & industrial new construction	Develop incentives for zero-net energy (ZNE) new construction to allow for growth without increasing the City's greenhouse gas emissions. Zero-net energy is a term for buildings that produce enough renewable energy to equal what they take from the power utility over the course of a year.
Adopt the most current IECC building code as written	Adopt the newest version of the energy code, as written, with no amendments, to yield energy savings. A new version of the IECC is released every three years. It is estimated that the 2015 IECC is 15% more energy efficient than the 2009 IECC (Currently in use by the City of St. Louis) assuming no energy saving elements are removed.
Adopt a rating and disclosure policy for sale of homes and minimum compliance through the energy code	Adopt a rating and disclosure policy for the sale of homes to help buyers and renters incorporate energy use into their process of choosing a home or investment. Require the disclosure of an energy audit at the time of sale to current or prospective tenants. The home will need to meet minimum compliance through the energy code.

Strategy 1.4: Make Energy Efficiency Measures Affordable

Energy efficiency improvements play a major role in achieving greenhouse gas emissions reductions. In order for all to participate – business owners, building owners, home owners, renters, and low-income residents – in improving energy efficiency, financing and assistance programs and options must be available. Reducing the financial burden and increasing the payoff will invite more people to participate in energy efficiency improvements.

Benefits: Improve building energy efficiency for homes and businesses to lower utility costs, reduce energy demands, and increase property values.

Challenges: Energy saving improvements do have a price tag, which can be a challenge for some, despite their significant return on investment.



CROSS CUTTING OUTCOMES

Social

- Affordable housing
- Education & training opportunities
- Active living, health & well-being
- Quality of life & neighborhood vitality
- Social equity & cultural diversity

Environmental

- Improved air quality
- Improved water quality
- Water conservation

Economic

- Green job opportunities
- Home or building investment
- Neighborhood Development or improvement
- Local business innovation & Entrepreneurship
- Reduced energy costs to tenants & building owners
- Reduced maintenance & repair costs
- Technology and innovation opportunities

CITY OF ST. LOUIS LEADING BY EXAMPLE

Energy Saving St. Louis CFL Distribution

In 2011, the City of St. Louis collaborated with Ameren Missouri, community partners, and hundreds of volunteers to distribute 96,000 Compact Fluorescent Light Bulbs (CFLs) to 24,000 households in 11 different wards as part of the Energy Saving St. Louis Initiative. The CFL bulb distribution effort helped residents save on utility bills and advance energy efficiency at the community level. It is estimated that the annual projected energy cost savings to participating residents would be nearly \$450,000.

Set the PACE St. Louis

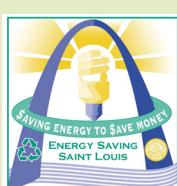
The City of St. Louis launched Set the PACE St. Louis in 2013, a Property Assessed Clean Energy (PACE) financing program for energy efficiency/renewable energy improvements to buildings. The program provides financing for commercial, municipal, and residential projects. The Missouri Athletic Club is currently undergoing a \$2.4 million energy-efficiency retrofit, with financing through Set the PACE St. Louis, and is saving \$205,000 annually in energy costs. The expanded Set the PACE St. Louis program will provide opportunities for minorities and women to receive training and potentially become apprentices with participating unions. This will help grow their skills and employability in the rapidly growing green job market.

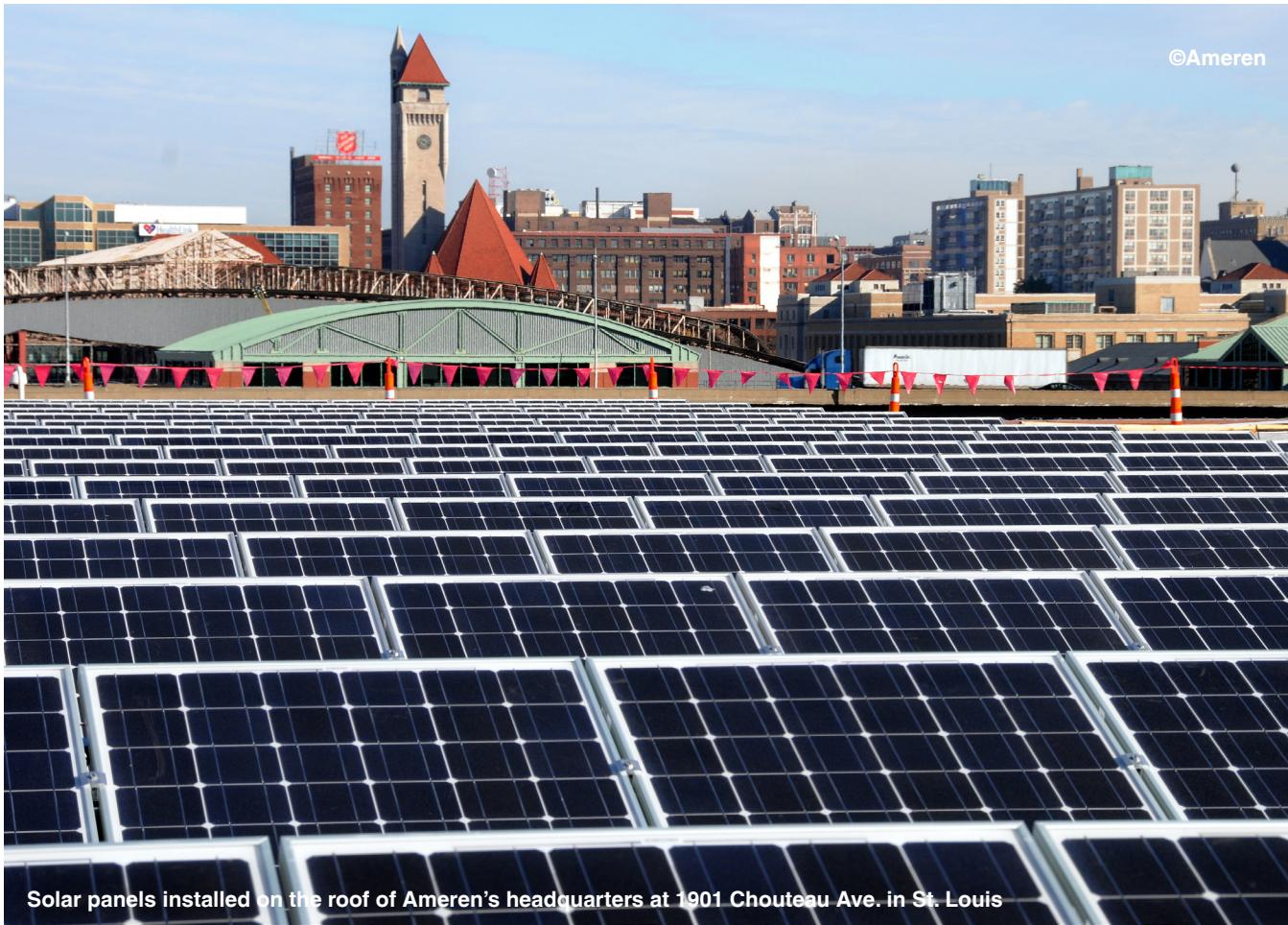
Mitigation Objective 1: Build an Energy Efficient City

STRATEGY 1.4

Make Energy Efficiency Measures Affordable

ACTIONS	
Aggressively market and expand energy efficiency rebate programs offered by utilities	Continue to accelerate energy efficient upgrades through rebate programs offered by utilities, to help residents and businesses improve the efficiency of their buildings and operations while lowering utility bills. Strongly market energy efficient rebate programs to increase awareness and expand participation.
Substantially expand funding for weatherization assistance program	Continue to maximize home energy savings for income-eligible residents. Expand the current Weatherization Assistance Program through the Urban League of Metropolitan St. Louis to include free weatherization job training and an expansion of services such as renewable energy measures, including solar water heating systems and solar (PV) installations.
Expand residential energy efficiency financing initiatives	Continue energy efficiency funding initiatives, such as Green HELP and Low-Interest Loans for Residential Energy Efficiency, to help fund energy-saving home improvements. Work to expand funding for these energy efficiency funding programs and increase participation.
Implement a no-cost energy assessment for residential buildings	Offer no-cost home energy assessments as part of utility energy efficiency programs. This service will provide home owners, renters, landlords, and multi-family building owners with an energy report outlining recommended energy efficiency improvements. Additional incentives can be offered to participants. (See Mass Save: http://www.masssave.com/)
Establish an energy concierge service to assist building owners and operators to take advantage of existing energy efficiency resources	An energy efficiency concierge service can provide support specifically for low-performing municipal and private buildings and multi-family affordable housing. This service, once established, can function as a one-stop shop for energy efficiency in the commercial, industrial, municipal, and multi-family housing sectors.
Coordinate with benchmarking program and expand use of Set the PACE St. Louis to finance energy saving projects	Coordinate with benchmarking efforts and utilize Set the PACE St. Louis to provide financing for energy efficient improvements and renewable energy systems. Expand both the benchmarking and PACE programs by increasing participation. Establish a target for this increased participation.
Revive Energy Saving St. Louis CFL distribution	Energy Saving St. Louis should be continued to assist residents in obtaining energy efficient materials. (See <i>City of St. Louis Leading By Example: Energy Saving St. Louis CFL Distribution Initiative</i> on the facing page).





RELATIONSHIP TO EXISTING PLANS, PROGRAMS, AND INITIATIVES

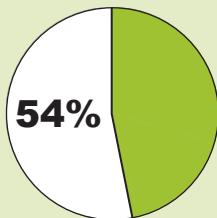
RELATIONSHIP KEY	SUSTAINABILITY PLAN						PROGRAMS & INITIATIVES						CITY, REGIONAL, & OTHER PLANS																	
	Urban Character, Vitality & Ecology	Arts, Culture & Innovation	Empowerment, Diversity & Equity	Health, Well-Being & Safety	Infrastructure, Facilities & Transportation	Education, Training & Leadership	Prosperity, Opportunity & Empowerment	City Energy Project	City of St. Louis Sustainable Neighborhood Initiative	City of St. Louis Vitality & Ecology Initiative	St. Louis Green Business Challenge	Energy Saving St. Louis (inactive)	Mississippi River Cities & Towns Initiative	MSD – Project Clear	Project Connect	Seitthe PACE St. Louis	Ameren – Integrated Resource Plan (IRP)	City of St. Louis P.I.E.R. Plan	City of St. Louis Resiliency Plan (in development)	City of St. Louis Sustainability Plan	Community Health Improvement Plan (CHIP)	Community Health Needs Assessment (CHA)	EMS Report – Lambert-St. Louis International Airport	Great Rivers Greenway District Gateway Bike Plan	Missouri Comprehensive State Energy Plan	MSD – Sanitary Sewer Overflow Control Master Plan	OneSTL Regional Plan for Sustainable Development	State of Missouri Technical Reference Manual	St. Louis Regional Hazard Mitigation Plan	St. Louis Regional VWP Task Force Community Plan
2. Accelerate Clean Renewable Energy																														
2.1 Provide Cleaner More Efficient Energy Sources	● ○ ● ● ● ○ ●	- - - - X - - - - - X	X - - - X - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X					
2.2 Advance Community Scale Renewable Energy Options & Utilization	● ○ ● ● ● ○ ●	- - - - X - - - - - X	X - - - X - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X	- - - - X - - - - - X					

MITIGATION OBJECTIVE 2

ACCELERATE CLEAN RENEWABLE ENERGY

In the City of St. Louis, electricity, predominately produced from burning coal, generates nearly 60% of community-wide greenhouse gas emissions. Natural gas, although less carbon intense than burning coal, is not a renewable source of energy and is the source of 18% of greenhouse gas emissions. Renewable energy production is critical for climate action success and achieving deep greenhouse gas emissions reductions. The production and distribution of clean renewable energy locally can provide an economic opportunity for green job creation, reduce vulnerability to energy price increase and volatility, and stimulate the local economy. **The National Renewable Energy Laboratory (NREL) estimates that Missouri has moderate solar resources, with over 200 sunny days per year and an annual daily average of 4.5-5.9 kWh/m²/day. At this level, Missouri's solar resource exceeds that of Germany, the world's leader in solar energy production.**¹⁵

To reach an 80% reduction of emissions by 2050, it is recommended that there be a combined target of 54% GHG emissions reduction from the energy source. The strategies and actions in this section are intended to help guide the community toward achieving this target.

OBJECTIVE	STRATEGIES & ACTIONS
<p>2. Accelerate Clean Renewable Energy</p>  <p>54%</p> <p>2050 GHG Source Reduction Target:</p> <p>54% = 2,973,000 mtCO₂e</p> <p>Source: Electricity</p>	<p>2.1 Provide Cleaner More Efficient Energy Sources</p> <ul style="list-style-type: none">• Expand Combined Heat and Power (CHP) capabilities within the City• Allow clean energy from the Grain Belt Express Clean Line (Wind Power)• Continuously increase the percentage of renewable energy sources• Improve existing power plants' efficiency by updating newer & replacing outdated coal-fired power plants with renewable sources• Reduce carbon emissions from coal-fired power plants• Increase Renewable Portfolio Standards (RPS) per Missouri Clean Energy Act• Promote microgrid installations powered by renewable resources <p>2.2 Advance Community Scale Renewable Energy Options & Utilization</p> <ul style="list-style-type: none">• Develop policy and initiatives to support solar installations• Permit, market & implement comprehensive solar installation program• Support community solar policies & projects to bring clean, sustainable power to all residents & businesses

15. Department of Economic Development Division of Energy, Missouri Comprehensive State Energy Plan, 2015, page 25.

Strategy 2.1: Provide Cleaner more Efficient Energy Sources

Coal-fired power plants generating electricity emit large amounts of greenhouse gases into the atmosphere and affect the quality of air we breathe. Asthma and other respiratory disease rates are high in the City in part because of the pollution emitted from burning coal for electricity production. Clean, inexhaustible renewable energy sources include: moving water, biomass, geothermal, solar, and wind. Solar energy resources should be leveraged to increase renewable energy sources at the utility scale.

Benefits: A switch to clean, renewable sources of electricity production can improve air quality and public health, create green jobs and economic opportunities, reduce greenhouse gas emissions, and create a better quality of life through improved public health.

Challenges: Utility willingness and investment in local renewable energy installations rather than purchasing RECs (Renewable Energy Credits).



CROSS CUTTING OUTCOMES

Social

- Education & training opportunities
- Active living, health & well-being
- Quality of life & neighborhood vitality
- Social equity & cultural diversity

Environmental

- Improved air quality
- Improved water quality

Economic

- Green job opportunities
- Local business innovation & Entrepreneurship
- Reduced energy costs to tenants & building owners
- Reduced maintenance & repair costs
- Technology and innovation opportunities

CITY OF ST. LOUIS LEADING BY EXAMPLE

IKEA Solar Installation

The City of St. Louis provides partnership and support for new development in the City that creates jobs, improves quality of life, and advances sustainability. The IKEA development is a positive addition to the City supporting the desire for sustainable development and creating over 300 new jobs. The new IKEA store has installed a rooftop solar installation that is the largest in the state: 259,000 square feet in size, producing 1.78 million kilowatt hours of electricity annually.

STRATEGY 2.1

Provide Cleaner more Efficient Energy Sources

ACTIONS	
Expand Combined Heat and Power (CHP) capabilities within the City	Combined Heat (i.e., steam) and Power (CHP) generates both electricity and heat at the same time to save energy. Expand the City's current steam heat distribution network and encourage large buildings, campuses, and districts to install dedicated, localized CHP Systems to achieve energy savings. PACE financing can be used for CHP installations.
Allow clean energy from the Grain Belt Express Clean Line (Wind Power)	Advocate for State-level approval of the Grain Belt Express Clean Line. The City of St. Louis can increase its renewable energy portfolio by receiving wind energy from the Clean Line Project. The Clean Line is an infrastructure project to transmit wind energy from western Kansas to utilities and customers in Missouri, Illinois, Indiana, and neighboring states.
Continuously increase the percentage of renewable energy sources	Increase renewable energy sources to replace and reduce coal use to achieve deep greenhouse gas emissions reductions. The burning of coal pollutes the air we breathe and can be linked to St. Louis' poor air quality and high levels of asthma. Increasing the percentage of renewable energy sources is critical for reducing greenhouse gas emissions and improving the quality of life in St. Louis.
Improve existing power plants' efficiency by updating newer coal-fired power plants and replacing outdated coal-fired power plants with renewable sources	Update coal-fired power plants with renewable energy sources to reduce the amount of carbon dioxide produced per megawatt hour. Switching power plants to natural gas does reduce GHG emissions, but is not a sustainable, long-term solution. Most of Missouri's coal plants are decades old. Ameren's newest coal plant was built almost 40 years ago and only one of Ameren's four plants has added pollution controls.
Reduce carbon emissions from coal-fired power plants	Ameren should continue to follow the reduction targets set out in the Clean Power Plan (CPP) to reduce carbon emissions from existing power plants that generate electricity. This would mean by 2022 Ameren should reduce carbon emissions from coal power plants by 7.4%, and 22.1% by 2030. Continue plans that were in place to meet these reduction targets.
Increase Renewable Portfolio Standards (RPS) per Missouri Clean Energy Act	In 2008, Missouri voters approved the Missouri Clean Energy Act requiring investor-owned utilities to meet mandatory Renewable Portfolio Standards (RPS). The RPS requires these utilities to use eligible renewable energy technologies to meet 15% of annual retail sales by 2021. Encourage the state to increase the RPS to advance renewable energy efforts.
Promote microgrid installations powered by renewable resources	Microgrids powered by locally generated renewable resources can help supply clean energy to buildings and improve resilience to power outages through the ability to disconnect and operate independently.

Strategy 2.2: Advance Community Scale Renewable Energy Options & Utilization

The consumption of electricity accounts for nearly 60% of community-wide greenhouse gas emissions. Electricity provided from Ameren UE, the primary electricity provider in St. Louis, produces much of its electricity from burning coal, which pollutes the air and results in large amounts of greenhouse gas emissions. Increasing the amount of renewable energy at the community scale, primarily through solar installations, will reduce energy generation from non-renewable sources.

Benefits: Increased use of renewable energy will provide economic opportunity for green jobs, lower utility bills, reduce peak energy demands and the risk of rising energy prices, and improve air quality and public health.

Challenges: Lack of incentives and rebates to lessen the upfront costs of solar installation, utility support, and maintenance.

CROSS CUTTING OUTCOMES
Social <ul style="list-style-type: none">◦ Education & training opportunities◦ Active living, health & well-being◦ Quality of life & neighborhood vitality◦ Social equity & cultural diversity
Environmental <ul style="list-style-type: none">◦ Improved air quality◦ Improved water quality
Economic <ul style="list-style-type: none">◦ Green job opportunities◦ Home or building investment◦ Neighborhood Development or improvement◦ Local business innovation & Entrepreneurship◦ Reduced energy costs to tenants & building owners◦ Reduced maintenance & repair costs◦ Technology and innovation opportunities



Rooftop wind turbines on the Sheet Metal Workers Local Union 36 building

Mitigation Objective 2: Accelerate Clean Renewable Energy

STRATEGY 2.2

Advance Community Scale Renewable Energy Options & Utilization

ACTIONS	
<i>Develop policy and initiatives to support solar installations</i>	Support solar power deployment by sending incremental and consistent policy signals to encourage gradual increases in solar deployment. Ensure City plans and land use regulations allow and encourage solar energy systems. Integrate solar provisions into future City comprehensive, sub-area, and functional plans. (See SunSolar Outreach Partnership: http://solaroutreach.org/)
<i>Permit, market & implement comprehensive solar installation program</i>	Permit solar installations to allow residential, commercial, and industrial building owners to produce their own power. Deploy marketing to raise awareness of the benefits of solar energy and the organizations that exist to help with installation, funding, and financing. Ensure City plans and land use regulations allow and encourage solar energy systems.
<i>Support community solar policies & projects to bring clean, sustainable power to all residents & businesses</i>	Develop community solar policies to allow for community solar projects that bring clean, sustainable power to people with locations that are not ideal for solar panels, or those that cannot afford the upfront cost of solar installations. Community Solar is an alternative that allows individuals to own an interest in solar panels that are not on their property, as well as access to any available tax incentives. (See ICLEI Solar Marketplace: http://icleiusa.org/programs/energy/solar-marketplace/)



Busch Stadium solar installation by Microgrid Energy



RELATIONSHIP TO EXISTING PLANS, PROGRAMS, AND INITIATIVES

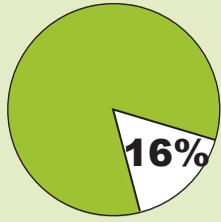
RELATIONSHIP KEY	SUSTAINABILITY PLAN	PROGRAMS & INITIATIVES	CITY, REGIONAL, & OTHER PLANS
● Direct Impact ○ Secondary Impact ○ Indirect Impact X Relationship to Plan	Urban Character, Vitality & Ecology Arts, Culture & Innovation Empowerment, Diversity & Equity Health, Well-Being & Safety Infrastructure, Facilities & Transportation Education, Training & Leadership Prosperity, Opportunity & Empowerment	City Energy Project City of St. Louis Sustainable Neighborhood Initiative City of St. Louis Urban Vitality & Ecology Initiative St. Louis Green Business Challenge Energy Saving St. Louis (inactive) Mississippi River Cities & Towns Initiative MSD – Project Clear Project Connect Set the PACE St. Louis	Ameren – Integrated Resource Plan (IRP) City of St. Louis P.I.E.R. Plan City of St. Louis Resiliency Plan (in development) City of St. Louis Sustainability Plan Community Health Improvement Plan (CHIP) Community Health Needs Assessment (CHA) EMS Report – Lambert-St. Louis International Airport Great Rivers Greenway District Gateway Bike Plan Missouri Comprehensive State Energy Plan MSD – Sanitary Sewer Overflow Control Master Plan OneSTL Regional Plan for Sustainable Development State of Missouri Technical Reference Manual St. Louis Regional Hazard Mitigation Plan St. Louis Regional YVP Task Force Community Plan
3. Create Equitable Access to Inter-Modal Transportation			
3.1 Integrate Land Use & Transportation for Healthy, Compact Development	● ○ ● ● ○ ○	- - - - - - - - X - - X - X - X - X - X - - X - - X	
3.2 Reduce Congestion & Vehicle Emissions	○ ○ ○ ● ● ○ ○	- - - - - - - - - - - X - - X - - X - - X - - X - - -	
3.3 Support Alternative Fuel Vehicles	○ ○ ○ ● ● ○ ○	- - - X - - - - - - - - X - - X - - X - - - X - - -	
3.4 Facilitate Alternative Commutes	● ○ ● ● ○ ○	- X X X - - - X - - X - X - X - X - X - X - - X - - X	

MITIGATION OBJECTIVE 3

CREATE EQUITABLE ACCESS TO INTER-MODAL TRANSPORTATION

Transportation options that are convenient, efficient, cost-effective, equitable, and seamlessly interconnected will help the City of St. Louis become healthier, improve quality of life, support various lifestyles, and increase economic opportunities. Creating equitable inter-modal transportation will help reduce greenhouse gas emissions from vehicle miles traveled.

To reach an 80% reduction of emissions by 2050, it is recommended that there be a combined sector target of 16% GHG emissions reduction from the vehicle miles traveled sector. The strategies and actions in this section are intended to help guide the community toward achieving this target. Implementation of a full range of strategies aimed at reducing GHG emissions from vehicle miles traveled is required and can be achieved by the development of policies, increased and improved transportation infrastructure, and personal behavioral changes.

OBJECTIVE	STRATEGIES & ACTIONS
<p>3. Create Equitable Access to Inter-Modal Transportation</p>  <p>2050 GHG Sector Reduction Target: 16% = 921,000 mtCO₂e Sector: Vehicle Miles Traveled (VMT)</p>	<p>3.1 Integrate Land Use & Transportation for Healthy, Compact Development</p> <ul style="list-style-type: none">Develop incentive program for reduced parking and eliminate parking code minimumsCreate a smart transit, parking, and bike systemExpand public transit infrastructure with supporting transit oriented developmentDevelop additional form-based codes to support transit oriented development (TOD) and mixed land and building uses <p>3.2 Reduce Congestion & Vehicle Emissions</p> <ul style="list-style-type: none">Expand opportunities for telecommuting and compressed work weeksLeverage Congestion Mitigation Air Quality (CMAQ) funding to improve traffic flowsUtilize occupancy sensors and sync traffic signals to reduce vehicle idling & improve traffic flowsDevelop monitoring and enforcement of anti-idling ordinanceEncourage implementation of anti-idling & telematics technologies and exhaust retrofits on vehiclesStudy Congestion Mitigation Strategies <p>3.3 Support Alternative Fuel Vehicles</p> <ul style="list-style-type: none">Develop infrastructure for the cost-effective use of electric vehiclesEnsure electric vehicle charging stations are solar poweredIncentivize the use of electric vehicles for private fleets <p>3.4 Facilitate Alternative Commutes</p> <ul style="list-style-type: none">Complete North South MetroLink Expansion PlansExpand employer incentives for ride-share, car-share, use of transit, and cyclingAggressively market and expand Metro's Commuter Advantage ProgramDesign bike-ped infrastructure that supports highly-used walking and cycling pathsImplement equitable bike share programContinue Complete Street Ordinance

Strategy 3.1: Integrate Land Use & Transportation for Healthy, Compact Development

The built environment has a significant impact on travel behavior. Land use policies that promote walkable and compact development accompanied by convenient and efficient transportation options can reduce vehicle miles traveled in the City.

Benefits: Walkable, transit-served neighborhoods, with mixed uses, support active living, aging in place, and social equity. Developing interconnected transportation options and a variety of uses are attractive to perspective residents and businesses and can help retain and grow the City's vibrant neighborhoods.

Challenges: Transportation infrastructure is expensive and willingness to change travel behavior can be hard for some people.

CROSS CUTTING OUTCOMES
Social <ul style="list-style-type: none">◦ Mobility & access to transportation◦ Food access and nutrition◦ Active living, health & well-being◦ Quality of life & neighborhood vitality◦ Social equity & cultural diversity
Environmental <ul style="list-style-type: none">◦ Improved air quality◦ Improved water quality
Economic <ul style="list-style-type: none">◦ Neighborhood Development or improvement◦ Land Use & Transportation Integration◦ Local business innovation & Entrepreneurship◦ Technology and innovation opportunities



MetroLink Downtown St. Louis

STRATEGY 3.1

Integrate Land Use & Transportation for Healthy, Compact Development

ACTIONS	
Develop incentive program for reduced parking and eliminate parking code minimums	Eliminate parking code minimums near transit-adjacent areas of the City to support transit oriented development and compact, walkable neighborhoods. Reduced parking in the City must be supported by an efficient, multi-modal, and inter-modal transportation system.
Create a smart transit, parking, and bike system	Develop a smart system to improve the efficiency and convenience of alternative commuting options. Smart systems, in reference to transportation, use technology to provide real-time information to users to allow for a more efficient use of transportation.
Expand public transit infrastructure with supporting transit oriented development	Expand transportation choices and improve transportation system efficiency to create an efficient and sustainable transportation system. Transportation infrastructure must be supported by transit oriented development (TOD) to effectively increase ridership, change travel behavior, and reduce vehicle miles traveled in the City. Transit oriented, compact, and multi-use districts and neighborhoods must be developed to support existing and planned transportation infrastructure.
Develop additional form-based codes to support transit oriented development (TOD) and mixed land and building uses	Establish additional form-based districts, specifically surrounding existing and planned public transportation infrastructure, to support transit oriented development and mixed land and building uses. Form-based codes that support transit oriented development decrease transportation-related GHG emissions. Mixed-use, transit-oriented neighborhoods provide residents walkable access to jobs, services, and amenities, which improves quality of life.



Transit Oriented Development adjacent to Central West End MetroLink Station

Strategy 3.2: Reduce Congestion & Vehicle Emissions

Vehicles traveling in the City of St. Louis primarily run on gasoline and diesel fuels, which result in 20% of community greenhouse gas emissions. The federal Corporate Average Fuel Economy (CAFE) standards will potentially improve vehicle fuel efficiency, reducing greenhouse gas emissions per vehicle mile traveled, by requiring car makers to produce more fuel efficient vehicles. Single occupant vehicle commuting causes a significant amount of traffic congestion, which leads to increased fuel consumption and air pollution. Traffic congestion and vehicle emissions can be reduced by reducing car trips and interconnecting traffic lights and signals to improve traffic flows.

Benefits: These measures will improve air quality, reduce congestion, and provide an increased quality of life in the City.

Challenges: Obtain funding for improvements and develop enforcement and monitoring systems for ordinances.



CROSS CUTTING OUTCOMES



Social

- Active living, health & well-being
- Quality of life & neighborhood vitality
- Social equity & cultural diversity



Environmental

- Improved air quality
- Improved water quality



Economic

- Neighborhood Development or improvement
- Land Use & Transportation Integration
- Local business innovation & Entrepreneurship
- Technology and innovation opportunities

CITY OF ST. LOUIS LEADING BY EXAMPLE

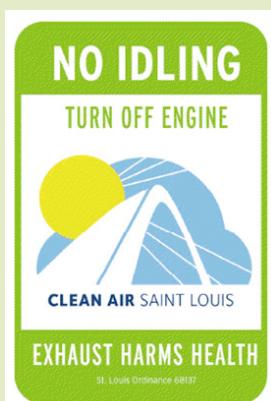
City Fleet Telematics Program

The City has installed telematics devices on its public works fleet to improve operational efficiency, reduce fuel consumption, and improve air quality by reducing harmful emissions. Telematics devices monitor idling, speed, route and location to improve route efficiency and eliminate extraneous trips. In 2011, the City installed more than 400 telematics units on fleet vehicles. Telematics installations have reduced idling as much as 9 hours per week in some trucks with a fleet average of 2.5 hours per week, saving the City money on fuel costs and extending the life of vehicle engines.

STRATEGY 3.2

Reduce Congestion & Vehicle Emissions

ACTIONS	
Expand opportunities for telecommuting & compressed work weeks	Employers in the City can offer telecommuting and compressed work weeks to eligible employees to help reduce traffic congestion and vehicle emissions. Businesses can save money by reducing office square footage, energy consumption, and parking required for workers.
Leverage Congestion Mitigation Air Quality (CMAQ) funding to improve traffic flows	Continue to improve air quality and relieve congestion through CMAQ projects. The City of St. Louis has begun CMAQ projects to upgrade traffic signals and signal control systems to optimize interconnection of traffic signals to improve traffic flow and have a positive impact on air pollution. CMAQ projects can be funded by the CMAQ program through the US Department of Transportation (DOT).
Utilize occupancy sensors and sync traffic signals to reduce vehicle idling & improve traffic flows	Reduce vehicle emissions due to vehicle idling and traffic congestion through the use of occupancy sensors and interconnected traffic signals. These improvements will improve traffic flow in the City.
Develop monitoring and enforcement of anti-idling ordinance	Continue the existing anti-idling ordinance that restricts the amount of time a vehicle can idle. Begin to monitor and enforce this ordinance in order to reduce air pollution from vehicle idling.
Encourage implementation of anti-idling and telematics technologies and exhaust retrofits on vehicles	Launch an idle reduction campaign and utilize state and federal incentives for idle reduction, telematics, and exhaust retrofit projects and equipment. Engage the commercial and industrial sectors in the efforts and highly encourage freight vehicles to participate.
Study Congestion Mitigation Strategies	The City of St. Louis has a significant amount of people commuting into the City for work, causing morning and evening traffic congestion. Study methods and best practices for reducing road congestion and encouraging alternative commutes. For example, implementing a road-charging system, combined with park-and-ride services and improved transportation options could reduce traffic congestions and encourage use of alternative transportation options. (See Stockholm: http://www-03.ibm.com/ibm/history/ibm100/us/en/icons/transportationflow/)



Strategy 3.3: Support Alternative Fuel Vehicles

Alternative fuel vehicles run on non-petroleum based fuels, which produce substantially less greenhouse gas emissions. Electric vehicles are low-emission vehicles and their adoption should be supported. To encourage consumer acceptance of electric vehicles, there must be adequate Electric Vehicle charging station infrastructure available to facilitate the cost-effective and convenient use of these vehicles in the City and private fleets. Because the City's electricity grid is supplied predominately from coal-fired power plants, electric charging stations that are powered by solar energy will further help reduce greenhouse gas emissions and vehicle emission reductions.

Benefits: Expanded fueling infrastructure will increase transportation options and reduce dependence on petroleum-based fuels. Solar charged fueling for electric vehicles will improve air quality, thus improving public health.

Challenges: Two major barriers to the adoption of alternative fuel vehicles are refueling infrastructure and consumer cost.



Spire Natural Gas fueling station at St. Louis Lambert International Airport

CROSS CUTTING OUTCOMES

 Social
<ul style="list-style-type: none">◦ Mobility & access to transportation◦ Education & training opportunities◦ Quality of life & neighborhood vitality
 Environmental
<ul style="list-style-type: none">◦ Improved air quality◦ Improved water quality
 Economic
<ul style="list-style-type: none">◦ Green job opportunities◦ Neighborhood Development or improvement◦ Land Use & Transportation Integration◦ Local business innovation & Entrepreneurship◦ Technology and innovation opportunities

CITY OF ST. LOUIS LEADING BY EXAMPLE

Airport Alternative Fuel Use

St. Louis Lambert International Airport is a leader in sustainable practices and is committed to continually increasing alternative fuel use to power its fleet vehicles. The Mayor's Sustainability Action Agenda set a goal to expand use of alternative fuels to 85% of the Airport's fleet. The Airport currently powers 79% of its fleet with alternative fuels including biodiesel, bi-Fuel, compressed natural gas (CNG), electric, propane, and diesel electric. Biodiesel fuel use is the most prominent, powering 41% of airport fleet vehicles.

STRATEGY 3.3

Support Alternative Fuel Vehicles

ACTIONS

Develop infrastructure for the cost-effective use of electric vehicles (EV)

Develop electric vehicle charging stations to further promote and facilitate the use of low-emission, electric vehicles in the City. To further encourage the adoption of these vehicles, preferred parking and driving lane incentives can be created for low-emission vehicles.

Ensure electric vehicle (EV) charging stations are solar powered

Currently, the electricity grid is largely supplied by coal-fired power plants. The burning of coal produces large amounts of greenhouse gas emissions. Electric charging stations should be solar powered to reduce air pollution from vehicle fueling.

Incentivize the use of electric vehicles (EV) for private fleets

Tax credits, rebates, and driving lane/parking preferences can encourage the switch to electric solar-charged vehicles in private fleets for the commercial and industrial sectors.



One of five EV charging stations at St. Louis Lambert International Airport

Strategy 3.4: Facilitate Alternative Commutes

Many trips in the City are made by the use of personal vehicles. Improving and expanding use of transit systems and other alternative commutes –such as ride-share, car-share, and bicycle– can help reduce greenhouse gas emissions from vehicle miles traveled and increase transportation options. Convenient, reliable, affordable and interconnected transportation systems can change personal behavior and encourage the use of alternative commutes. Transportation services should be expanded and planned for equitable access to jobs, services, vibrant commercial areas, and quality public spaces.

Benefits: Public transportation infrastructure investments attract development and enhance the City and serve to link people to jobs, education, and health care providers.

Challenges: Alternative commuting infrastructure for public transit and cycling requires funds, and willingness to change travel behavior can be hard for some people.



CITY OF ST. LOUIS LEADING BY EXAMPLE

City Cycling Initiative

The City has launched many sustainability initiatives to improve bicycle and pedestrian infrastructure. In April 2011, the region's first public commuter bicycle station opened in Downtown St. Louis, featuring bicycle racks, lockers, showers, and a repair facility. The City boasts an impressive bicycle network with over 130 miles of bike lanes, routes and trails, and continues to maintain and improve bicycle infrastructure with bike lanes and bike racks. The Mayor's Sustainability Action Agenda had a target to increase the number of dedicated bicycle lanes by 150% and shared road facilities by 35%. The City has made great progress on this goal and has increased dedicated bike lanes 239% and shared lanes 15.5%, which is on track to meet the goal.

City Employees Carpool with RideFinders

The City of St. Louis Human Resource Department led an effort to make RideFinders, the St. Louis area free public ridesharing service, available to City employees to encourage carpools and vanpools. Reducing the number of cars on the road will help reduce greenhouse gas emissions from vehicles and improve traffic flows and air quality. RideFinders awarded one of three 2016 Regional Sustainability Awards to The City of St. Louis for its sustainable rideshare achievements.

CROSS CUTTING OUTCOMES

Social

- Mobility & access to transportation
- Education & training opportunities
- Food access and nutrition
- Active living, health & well-being
- Crime reduction & safety improvements
- Quality of life & neighborhood vitality
- Social equity & cultural diversity

Environmental

- Aesthetic / Beautification
- Flood mitigation / Stormwater control
- Heat island mitigation
- Improved air quality
- Improved water quality
- Expanded tree canopy, green space & ecosystem services

Economic

- Green job opportunities
- Neighborhood Development or improvement
- Land Use & Transportation Integration
- Local business innovation & Entrepreneurship
- Technology and innovation opportunities

STRATEGY 3.4

Facilitate Alternative Commutes

ACTIONS	
Complete North South MetroLink Expansion Plans	Construct the North-South MetroLink expansion to expand north and south public transportation access in the City.
Expand employer incentives for ride-share, car-share, use of transit, and cycling	Encourage employee alternative commuting through employer incentive offers. Large employers in the City should be challenged to develop and implement plans to reduce single occupant vehicles (SOV) commuting to work, which causes a significant amount of GHG emissions and traffic congestion.
Aggressively market and expand Metro's Commuter Advantage Program	Encourage employers to strongly market Metro's Commuter Advantage program to their employees to help expand the program, possibly reduce vehicle miles traveled in the City, and increase public transit ridership. Employers utilizing this incentive can deduct the costs as business expenses and save monthly on payroll tax for participating employees.
Design bike-ped infrastructure that supports highly-used walking and cycling paths	Infrastructure improvements should include a network of bike share dock stations, additional bike parking in key areas, long-term bike storage, and additional bicycle commuter stations strategically placed throughout the City to support biking culture and expand user groups. Increasing use of bike-ped infrastructure means improving safety, convenience, and connectivity of the network.
Implement equitable bike share program	Increase transportation options and convenience by introducing a bike share program. Expand cycling infrastructure to support this program. A bike share system is a network of shared bikes and docking stations for short-term use.
Continue Complete Street Ordinance	Continue to incorporate complete street principles into road construction projects. Complete streets is a transportation policy and design approach that requires streets to be designed, constructed, and operated so that users of all ages and abilities can travel safely and independently regardless of their mode of transportation.





RELATIONSHIP TO EXISTING PLANS, PROGRAMS, AND INITIATIVES

RELATIONSHIP KEY	SUSTAINABILITY PLAN										PROGRAMS & INITIATIVES										CITY, REGIONAL, & OTHER PLANS									
	Urban Character, Vitality & Ecology	Arts, Culture & Innovation	Empowerment, Diversity & Equity	Health, Well-Being & Safety	Infrastructure, Facilities & Transportation	Education, Training & Leadership	Prosperity, Opportunity & Empowerment	City Energy Project	City of St. Louis Sustainable Neighborhood Initiative	City of St. Louis Vitality & Ecology Initiative	St. Louis Green Business Challenge	Energy Saving St. Louis (inactive)	Mississippi River Cities & Towns Initiative	MSD – Project Clear	Project Connect	Seize the PACE St. Louis	Ameren – Integrated Resource Plan (IRP)	City of St. Louis P.I.E.R. Plan	City of St. Louis Resiliency Plan (in development)	City of St. Louis Sustainability Plan	Community Health Improvement Plan (CHIP)	Community Health Needs Assessment (CHA)	EMS Report – Lambert-St. Louis International Airport	Great Rivers Greenway District Gateway Bike Plan	Missouri Comprehensive State Energy Plan	MSD – Sanitary Sewer Overflow Control Master Plan	OneSTL Regional Plan for Sustainable Development	State of Missouri Technical Reference Manual	St. Louis Regional Hazard Mitigation Plan	St. Louis Regional YWP Task Force Community Plan
4. Support Community Well-Being																														
4.1 Empower the Community for a Prosperous Green Economy	● ○ ● ● ○ ○ ●	X X X - - - - - X X	- X X - - - - - X -	- X X X X X X - X -	- X X - - - - X -	- X X X X X X - X -	- X X - - - - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -		
4.2 Create Vibrant Neighborhoods that Advance Public Health & Safety	● ○ ● ● ○ ○ ●	- X X - - - - - X -	- X X - - - - - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -	- X X X X X X - X -		

MITIGATION OBJECTIVE 4

SUPPORT COMMUNITY WELL-BEING

Community well-being refers to health and safety as well as economic prosperity. Climate Protection efforts provide an opportunity to improve economic prosperity, build social capital, increase community resilience, and advance public health and safety in the City. Factors leading to climate change have adversely impacted low-income and minority communities. Ensure these vulnerable population groups are benefiting from GHG mitigation efforts by vetting climate action planning measures through a community engagement process to understand the challenges for implementation success. The strategies outlined in this section are supporting GHG emission reduction measures and their effects on reducing GHG emissions are represented in the other mitigation sections of this Plan.



OBJECTIVE	STRATEGIES & ACTIONS
4. Support Community Well-Being *Supporting Measures (No GHG Emissions Reduction Target)	<p>4.1 Empower the Community for a Prosperous Green Economy</p> <ul style="list-style-type: none">• Continue and expand existing job programs to include green jobs training & opportunities• Expand access to services and high-quality affordable housing through mixed-use development• Develop a comprehensive community education and outreach energy reduction program• Conduct ongoing networking and education programs for community engagement focused on sustainability <p>4.2 Create Vibrant Neighborhoods that Advance Public Health & Safety</p> <ul style="list-style-type: none">• Start an initiative to “Build Healthy Communities”• Utilize Crime Prevention Through Environmental Design (CPTED) practices• Develop healthy, safe environments that improve public health

Strategy 4.1: Empower the Community for a Prosperous Green Economy

Green job markets and innovation opportunities will emerge as climate action planning progress continues. Youth and other residents seeking employment options can be taught skills that will make them marketable for emerging green job opportunities. As climate action planning is instituted, equitable prosperity must be at the core of implementation efforts.

Benefits: Access to job training, education, affordable housing, and community outreach can empower residents and help build a skilled employee base to attract green job markets to the City for a prosperous green economy.

Challenges: The capacity and resources necessary to sustain and expand empowerment programs.

CROSS CUTTING OUTCOMES	
 Social	<ul style="list-style-type: none">◦ Affordable housing◦ Education & training opportunities◦ Food access and nutrition◦ Active living, health & well-being◦ Crime reduction & safety improvements◦ Quality of life & neighborhood vitality◦ Social equity & cultural diversity
 Environmental	<ul style="list-style-type: none">◦ Aesthetic / Beautification◦ Heat island mitigation◦ Improved air quality◦ Improved water quality◦ Water conservation
 Economic	<ul style="list-style-type: none">◦ Green job opportunities◦ Home or building investment◦ Neighborhood Development or improvement◦ Land Use & Transportation Integration◦ Reduced energy costs to tenants & building owners◦ Reduced maintenance & repair costs◦ Technology and innovation opportunities



CITY OF ST. LOUIS LEADING BY EXAMPLE

SLATE, STL Youth Jobs & Urban Vitality & Ecology (UVE) Initiative Baden Pilot Project

Mayor Slay's Sustainability Action Agenda aimed to employ 500 youth in annual summer job programs. SLATE (St. Louis Agency on Training and Employment) provides training and job placement services to the St. Louis City's adult workforce. SLATE and STL Youth Jobs has greatly advanced this effort by practicing demand-driven skill building to develop a workforce with the skills needed to fill available jobs. Providing opportunities for employment can help reduce crime caused by "unengaged youth." Additionally, the UVE Baden Pilot Project started a youth gardening program employing several local young adults to foster community engagement within the community garden.

Mitigation Objective 4: Support Community Well-Being

STRATEGY 4.1

Empower the Community for a Prosperous Green Economy

ACTIONS	
<i>Continue and expand existing job programs to include green jobs training & opportunities</i>	Ensure equitable opportunities in new green job markets to advance the community through training and apprenticeship opportunities. Engage existing job programs in this effort and reach out to youth employment and training programs to teach skills for the green job market. (See St. Clair County: https://www.ulstl.com/economic-empowerment/weatherization-training-program-st-clair-county/)
<i>Expand access to services and high quality affordable housing through mixed use development</i>	Mixed-use, high-quality affordable housing developments with needed amenities, such as grocery stores, benefit the community through improved quality of life, job creation, and elimination of blighted areas leading to economic revitalization.
<i>Develop a comprehensive community education and outreach energy reduction program</i>	Develop a program to educate and assist community members in taking advantage of existing energy efficiency resources. Provide information on how and where to get utility incentives, financing options, and training. As part of education and outreach efforts, initiate neighborhood energy efficiency competitions and challenges. Encourage neighborhood level organizations and leadership to take a lead role in this program.
<i>Conduct ongoing networking and education programs for community engagement focused on sustainability</i>	Continuously engage residents & stakeholders in conversations about sustainability, related to greenhouse gas mitigation, to educate the community and build relationships through networking to empower the community to take climate action.



St. Louis youth working at the Baden Community Garden

Strategy 4.2: Create Vibrant Neighborhoods that Advance Public Health & Safety

Vibrant neighborhoods nurture health and improve safety. Develop safe and vibrant neighborhoods that foster social, environmental and economic benefits through high quality urban design and planning. Vibrant neighborhoods have quality mobility options; public space amenities such as street trees, sidewalks, and safe streets; affordable housing, education, and employment opportunities; and access to healthy foods and active living. Utilize climate action implementation to reinvest in struggling neighborhoods to improve quality of life.

Benefits: Reinvesting in underserved neighborhoods will help address the social determinants of health.

Challenges: Cost of improvements and desire to invest in struggling areas of the City.



Vibrant street life on Euclid Avenue in the Central West End

CROSS CUTTING OUTCOMES

Social

- Mobility & access to transportation
- Affordable housing
- Education & training opportunities
- Food access and nutrition
- Active living, health & well-being
- Crime reduction & safety improvements
- Quality of life & neighborhood vitality
- Social equity & cultural diversity

Environmental

- Aesthetic / Beautification
- Flood mitigation / Stormwater control
- Heat island mitigation
- Improved air quality
- Improved water quality
- Expanded tree canopy, green space & ecosystem services

Economic

- Green job opportunities
- Home or building investment
- Neighborhood Development or improvement
- Land Use & Transportation Integration

Mitigation Objective 4: Support Community Well-Being

STRATEGY 4.2

Create Vibrant Neighborhoods that Advance Public Health & Safety

ACTIONS	
Start an initiative to “Build Healthy Communities”	<p>There is a strong correlation between neighborhood location/demographics and health. Invest in the creation of vibrant neighborhoods in zip codes with social determinants of health. Vibrant neighborhoods have quality mobility options; public space amenities such as street trees, sidewalks, and safe streets; affordable housing, education, and employment opportunities; and access to healthy foods and active living. (See City of New York, Building Healthy Communities Initiative: http://www1.nyc.gov/nyc-resources/building-healthy-communities.page)</p>
Utilize Crime Prevention Through Environmental Design (CPTED) practices	<p>Follow CPTED principles when making decisions about and improvements to the built environment. Climate action planning requires improvements to the City's street network, transit systems, street and traffic lights and signals, buildings, and landscapes. Improve real and perceived safety by practicing Crime Prevention Through Environmental Design (CPTED).</p>
Develop healthy, safe environments that improve public health	<p>Ensure funds administered through public entities support projects that improve public health and safety. Projects that lead to decreased air quality, or quality of life should not be allowed public tax dollars.</p>



Dedicated painted bike lane on Wydown Blvd.



RELATIONSHIP TO EXISTING PLANS, PROGRAMS, AND INITIATIVES

RELATIONSHIP KEY

- Direct Impact
- Secondary Impact
- Indirect Impact
- X Relationship to Plan

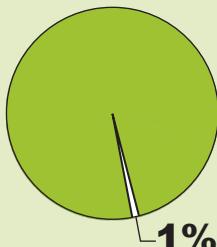
5. Protect Natural Resources & Greenspaces	Urban Character, Vitality & Ecology						Sustainability Plan						Programs & Initiatives						City, Regional, & Other Plans									
	Arts, Culture & Innovation	Empowerment, Diversity & Equity	Health, Well-Being & Safety	Infrastructure, Facilities & Transportation	Education, Training & Leadership	Prosperity, Opportunity & Empowerment	City Energy Project	City of St. Louis Sustainable Neighborhood Initiative	City of St. Louis Urban Vitality & Ecology Initiative	St. Louis Green Business Challenge	Energy Saving St. Louis (inactive)	Mississippi River Cities & Towns Initiative	MSD – Project Clear	Project Connect	Set the PACE St. Louis	Ameren – Integrated Resource Plan (IRP)	City of St. Louis P.I.E.R. Plan	City of St. Louis Sustainability Plan (in development)	City of St. Louis Resiliency Plan (in development)	Community Health Improvement Plan (CHIP)	Community Health Needs Assessment (CHA)	EMS Report – Lambert-St. Louis International Airport	Great Rivers Greenway District Gateway Bike Plan	Missouri Comprehensive State Energy Plan	MSD – Sanitary Sewer Overflow Control Master Plan	OneSTL Regional Plan for Sustainable Development	State of Missouri Technical Reference Manual	St. Louis Regional Hazard Mitigation Plan
5.1 Restore & Regenerate Natural Systems as Carbon Sinks	● ○ ○ ● ○ ○ ○	-	X X - -	X X X -	-	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -		
5.2 Improve Water Efficiency	● ○ ○ ○ ○ ○ ○	X X X X -	X X X X -	-	-	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	
5.3 Reduce Waste & Consumption	● ○ ○ ○ ○ ○ ○	- X - X -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	

MITIGATION OBJECTIVE 5

PROTECT NATURAL RESOURCES & EXPAND GREENSPACES

Natural resources absorb carbon from the atmosphere and reduce pollutants in the air, improving quality of life and health. Trees help absorb carbon dioxide and serve as a social and economic amenity. Wetlands have been lost to development, and trees are being lost to disease. Finite natural resources, such as water sources, must be conserved, and ecosystem functions should be supported through habitat protection and restoration. Natural resources help mitigate carbon dioxide and serve as a social and economic amenity.

To reach an 80% reduction of emissions by 2050, it is recommended that there be a combined sector target of 1% GHG emissions reduction from the wastewater and solid waste sectors. The strategies and actions in this section are intended to help guide the community toward achieving this target. Trees, plants and wetlands do not reduce GHG emissions from the consumption of carbon intense fuel sources; however, they do offset the effects of greenhouse gas emissions in the atmosphere by absorbing carbon dioxide, the most abundant greenhouse gas emitted into the atmosphere.

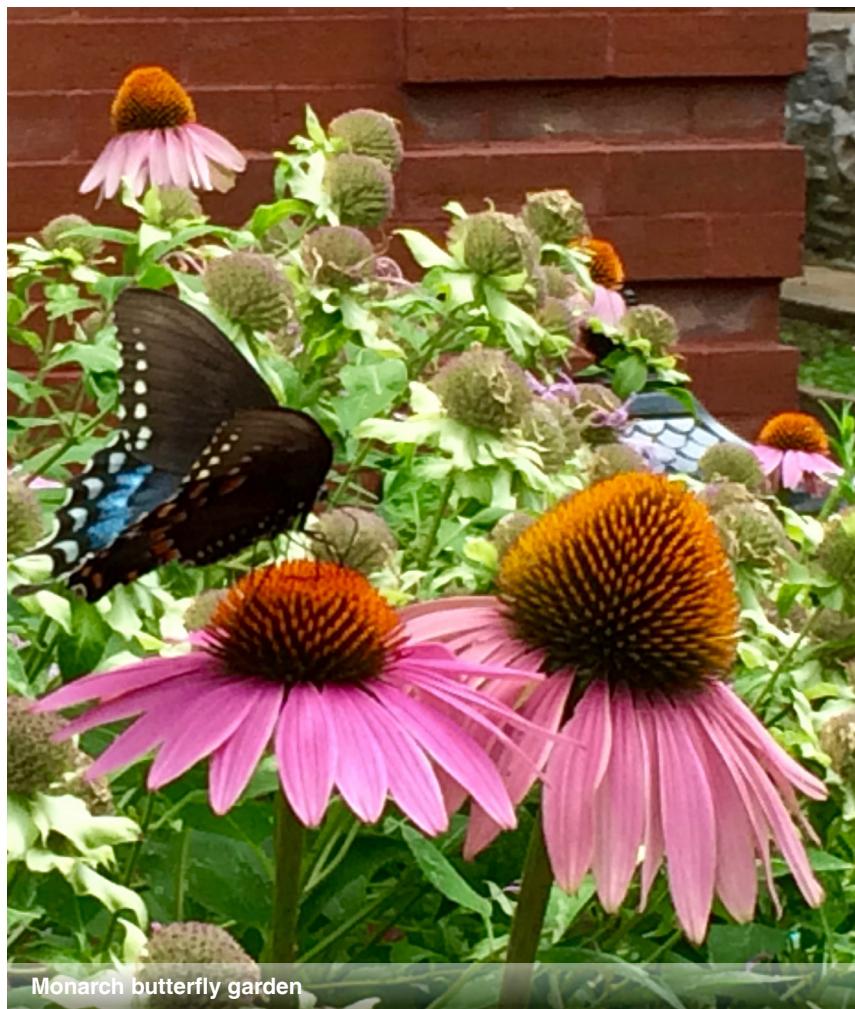
OBJECTIVE	STRATEGIES & ACTIONS
<p>5. Protect Natural Resources & Greenspaces</p>  <p>2050 GHG Sector(s) Reduction Target:</p> <p>1% = 53,000 mtCO₂e</p> <p>Sectors: Solid Waste, Wastewater Treatment & Facilities</p>	<p>5.1 Restore & Regenerate Natural Systems as Carbon Sinks</p> <ul style="list-style-type: none">• Increase tree canopy for biological sequestration• Develop new urban forests and ecological restoration areas as carbon sinks• Minimize removal of trees and landscape biomass to reduce CO₂ in the atmosphere• Continue to naturalize the public and private landscapes to create carbon biomass storage• Encourage restoration or reconstruction of wetland areas along all rivers and streams to absorb carbon <p>5.2 Improve Water Efficiency</p> <ul style="list-style-type: none">• Continue improvements to the aging water infrastructure to reduce water loss during distribution• Reduce water consumption through installation of low-flow fixtures• Educate community on water saving behavior• Ensure all buildings are metered• Adopt low-flow/regulated sprinkler and irrigation guidelines• Utilize rainwater capture and reuse methods and practices• Utilize Set the PACE St. Louis Program to finance water saving projects <p>5.3 Reduce Waste & Consumption</p> <ul style="list-style-type: none">• Develop a plan for aggressive waste diversion• Expand composting services to include the collection of food waste• Adopt a construction & demolition waste diversion program with incentives

Strategy 5.1: Restore & Regenerate Natural Systems as Carbon Sinks

Natural resources –such as plants, trees, and wetlands– absorb carbon dioxide from the atmosphere, helping to offset pollution caused by emissions. Some natural resources have lost functionality, or been converted through development. Restoring and regenerating these natural systems will help offset carbon emissions and increase biodiversity. Connecting people with urban natural resources can help improve their mental health and well-being. Park improvements, green infrastructure projects, and tree planting efforts should be conducted to optimize carbon dioxide absorption. **The City of St. Louis has the potential to increase its urban tree canopy an additional 33.9% (13,479 acres)¹⁶**, according to the St. Louis Urban Tree Canopy Assessment conducted by Forest ReLeaf of Missouri.

Benefits: Natural systems, including plants and trees, improve neighborhood vibrancy, which increase environmental, social and economic health and well-being. Increased access to natural systems can help retain and grow businesses and population in the City.

Challenges: Financial capacity for restoration work and efforts to protect the natural environment from insect infestation, heat stress, and diseases.



CROSS CUTTING OUTCOMES



Social

- Education & training opportunities
- Food access and nutrition
- Active living, health & well-being
- Quality of life & neighborhood vitality
- Social equity & cultural diversity



Environmental

- Aesthetic / Beautification
- Flood mitigation / Stormwater control
- Heat island mitigation
- Improved air quality
- Improved water quality
- Expanded tree canopy, green space & ecosystem services
- Biodiversity & native species
- Water conservation



Economic

- Green job opportunities
- Neighborhood Development or improvement
- Reduced maintenance & repair costs
- Technology and innovation opportunities

STRATEGY 5.1

Restore & Regenerate Natural Systems as Carbon Sinks

ACTIONS	
<i>Increase tree canopy for biological sequestration</i>	Some trees are better than others at absorbing carbon dioxide. Reforestation plans to increase the urban tree canopy (UTC) should be developed to optimize carbon storage and sequestration while providing a mixture of tree species to be more resilient to unknown future diseases and insect infestations that could be a result of climate change. The City of St. Louis' existing UTC is 18.2% (7,237 acres) and has the potential to expand an additional 33.9% (13,479 acres) according to the St. Louis Urban Tree Canopy Assessment conducted by Forest ReLeaf of Missouri.
<i>Develop new urban forests and ecological restoration areas as carbon sinks</i>	Support ongoing restoration efforts and increase urban forest planting for the purpose of carbon capture to mitigate greenhouse gases in the atmosphere, and serve as a social and economic community amenity.
<i>Minimize removal of trees and landscape biomass to reduce CO₂ in the atmosphere</i>	Minimize the amount of biomass removal of public trees and landscapes to allow for an increased amount of carbon storage and to support the City's tree ordinance, which requires no net loss in the population and canopy of its urban forest. When planting trees, their mature size should be planned for to avoid conflicts between tree branches and man-made infrastructure (i.e. power lines) to reduce future biomass removal.
<i>Continue to naturalize the public and private landscapes to create carbon biomass storage</i>	Naturalize public and private landscapes in the City and reduce the amount of ground surface covered by lawn grass to increase carbon biomass storage in the City. Native planting practices and standards should be incorporated into green building initiatives and challenges, and should be adopted as a sustainable ordinance for the City of St. Louis to build upon efforts from the City's Urban Vitality & Ecology Initiative, which serves to better connect people to urban nature.
<i>Encourage restoration or reconstruction of wetland areas along all rivers and streams to absorb carbon</i>	Wetland areas have been lost overtime to make room for development. Wetland restoration and reconstruction projects should be encouraged and incorporated into future planning efforts along rivers, streams, and watersheds for purposes of flood control and carbon storage.

Strategy 5.2: Improve Water Efficiency

Treating, pumping, and distributing water to the City through underground pipes requires energy. Leaks in aging pipes cause the system to utilize more energy to move water. Energy is used to convey and treat water at wastewater treatment facilities. Energy use related to water can be reduced through water conservation behavioral changes, such as reducing shower times, utilizing water saving fixtures, and capturing rainwater for reuse. Although greenhouse gas emissions in the City related to wastewater treatment and facilities are small (<1%), water is a finite resource that should be conserved and protected for future use and enjoyment.

Benefits: Saving water can reduce utility bills and reduce the amount of water entering the wastewater system and being treated each day.

Challenges: The cost is high for improving aging water infrastructure.



CITY OF ST. LOUIS LEADING BY EXAMPLE

Municipal Water Savings

The City of St. Louis set a goal in the Mayor's Sustainability Action Agenda to reduce City government use of water 10% by 2018. In 2013, baseline City water usage was 12.3 million gallons per day (MGD) so the goal to reduce water usage by 10% is 1.23 MGD on average. The City has been working toward this goal through the implementation of several projects. Based on estimated savings, the City has achieved 99.7% of its 2018 Action Agenda goal.

CROSS CUTTING OUTCOMES

Social

- Mobility & access to transportation
- Affordable housing
- Education & training opportunities
- Food access and nutrition
- Active living, health & well-being
- Crime reduction & safety improvements
- Quality of life & neighborhood vitality
- Social equity & cultural diversity

Environmental

- Aesthetic / Beautification
- Flood mitigation / Stormwater control
- Improved air quality
- Improved water quality
- Water conservation

Economic

- Green job opportunities
- Home or building investment
- Neighborhood Development or improvement
- Local business innovation & Entrepreneurship
- Reduced energy costs to tenants & building owners
- Reduced maintenance & repair costs
- Technology and innovation opportunities

STRATEGY 5.2

Improve Water Efficiency

ACTIONS	
Continue improvements to the aging water infrastructure to reduce water loss during distribution	Upgrade the aging water infrastructure by replacing water mains and repairing leaks to improve the efficiency of the system. Treating, pumping, and distributing water to the City through underground pipes requires energy; improvements to the system can help reduce energy consumption.
Reduce water consumption through installation of low-flow fixtures	Install low-flow, high-efficiency water fixtures and systems to reduce wastewater. New construction projects should be incentivized to exceed plumbing code standards.
Educate community on water saving behavior	Large amounts of water can be saved by changing water usage behaviors. Educate the community on no-cost water saving techniques such as shortening shower times, turning off the sink when brushing teeth, and filling the sink to do dishes, rather than continually running the water.
Ensure all buildings are metered	Measure water usage in buildings by installing water meters. Currently, many buildings are not metered in the City and therefore they have no cost incentive to reduce water consumption. Require water meters to be installed on existing building for sale of property and require the installation of water meters on all new or major renovation industrial, commercial, and residential projects.
Adopt low-flow/regulated sprinkler and irrigation guidelines	Develop irrigation guidelines for public and private landscape projects that encourage more efficient sprinkler and irrigation systems to reduce water usage due to landscape maintenance.
Utilize rainwater capture and reuse methods and practices	Harvest rainwater for grey water uses such as toilet flushing and irrigation. This practice reduces stormwater runoff and conserves potable water.
Utilize Set the PACE St. Louis Program to finance water saving projects	Obtain legislative approval and support to use Set the PACE St. Louis financing for water efficiency projects at commercial, residential and municipal buildings.

Strategy 5.3: Reduce Waste & Consumption

Promote reduce, reuse, and recycle methods in the community to minimize landfill-bound waste. Although solid waste accounts for less than 1% of greenhouse gas emissions in the City, it is important to divert landfill waste to protect land resources for future generations.

Benefits: Recycling materials and composting organic waste can lessen landfill-bound waste, reducing landfill tipping fees and area of land used for landfill waste.

Challenges: Educating people on reducing consumption and reuse techniques



CROSS CUTTING OUTCOMES



Social

- Mobility & access to transportation
- Affordable housing
- Education & training opportunities
- Food access and nutrition
- Active living, health & well-being
- Crime reduction & safety improvements
- Quality of life & neighborhood vitality
- Social equity & cultural diversity



Environmental

- Aesthetic / Beautification
- Improved air quality
- Improved water quality
- Expanded tree canopy, green space & ecosystem services



Economic

- Green job opportunities
- Neighborhood Development or improvement
- Local business innovation & Entrepreneurship
- Technology and innovation opportunities

CITY OF ST. LOUIS LEADING BY EXAMPLE

Single-Stream Recycling

In 2011, the City of St. Louis began residential single-stream recycling services city-wide. This service collects recyclable materials from alleys and curbs making it convenient for residents. St. Louis City Recycles, a program of the City of St. Louis, estimates that St. Louisans recycled 15,500 tons in 2016. Goals are continually being set to advance sustainability. In 2018 the City of St. Louis community hopes to recycle 31,000 tons. The City set a goal to have single-stream recycling facilities for 100% of City government buildings and has nearly achieved this goal.

STRATEGY 5.3

Reduce Waste & Consumption

ACTIONS	
Develop a plan for aggressive waste diversion	Divert waste from landfills by reducing consumption and reusing materials. Multi-family, commercial, industrial, and institutional entities should be held to a recycling and waste diversion standard or be required to utilize a “pay as you throw” method. Continue neighborhood recycling programs, and introduce neighborhood recycling challenges and educational campaigns to divert waste from landfills.
Expand composting services to include the collection of food waste	Expand composting services to collect food waste from restaurants, grocery stores, markets, large events, cafeterias, and residents. This compost can be used as fertilizer in parks, community gardens, and residential landscaping.
Adopt a construction & demolition waste diversion program with incentives	Implement a program with incentives to reduce demolition and new construction project waste in landfills. Require 100% diversion of all recyclable materials, and encourage design planning to minimize material waste.

Two blue recycling bins are shown side-by-side. The bin on the left has a white "RECYCLE" logo with three arrows forming a triangle and the website "www.stlouis-mo.gov/recycle". The bin on the right has a "CITY RECYCLES" logo and several other logos for funding partners, including "MISSOURI DEPARTMENT OF NATURAL RESOURCES" and "MISSOURI CONSERVATION COMMISSION".

Recycling bins in City of St. Louis government buildings

ADAPTATION GOAL: BUILD A STRONG, EQUITABLE & CLIMATE RESILIENT CITY

Objective 1: **PRESERVE & ENHANCE THE NATURAL ENVIRONMENT**

Objective 2: **PROTECT HUMAN HEALTH & SAFETY**

Objective 3: **MAXIMIZE PREPAREDNESS EFFORTS**

The City of St. Louis is expected to experience **higher temperatures and more heavy rainfall**. These climate hazards **are likely to have significant impacts on public health and safety**. Nation-wide the dangerous effects of climate change often hit hardest **in low-income communities and communities of color**.



Background on Climate Resilience in the City

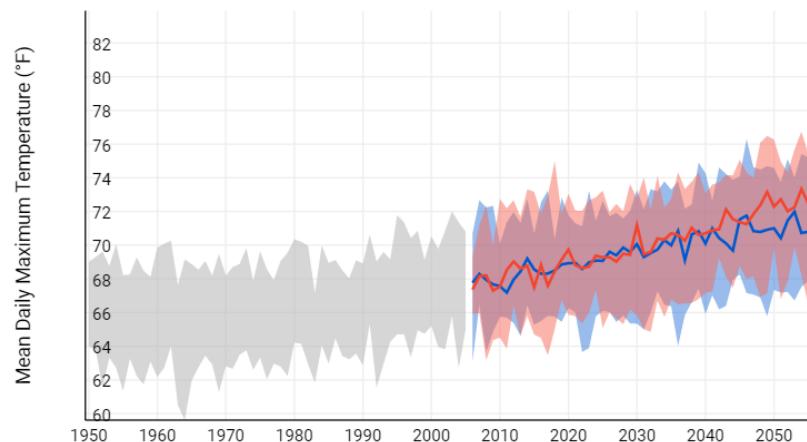
Commitment to Adaptation Planning

On November 13, 2015, Mayor Francis Slay signed the Compact of Mayors, which requires cities to identify climate hazards and create a climate adaptation plan. The City of St. Louis, as part of its commitment to the Compact of Mayors, has classified and identified climate hazards (listed on page 17 and discussed on the next page).

This section of the Plan is intended to guide adaptation efforts to help the community be resilient to climate change. Three (3) adaptation objectives are outlined in this section. These objectives contain strategies and actions to address the climate hazards and help the community adapt to protect public health and safety and be more resilient to the effects of climate change.

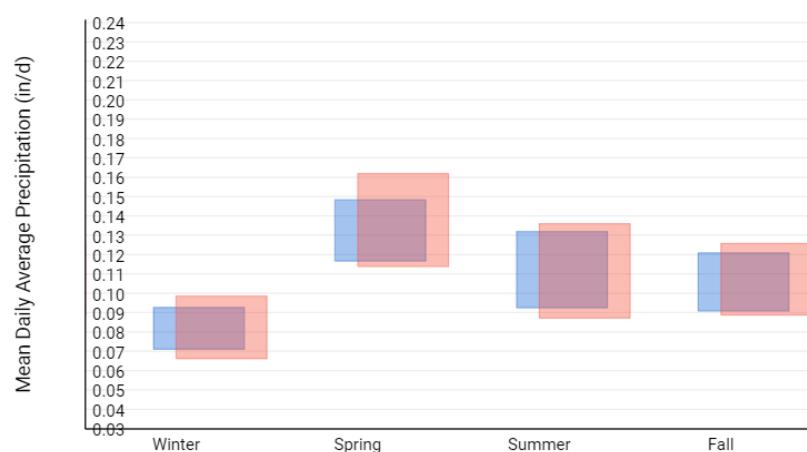
In December 2014, the City of St. Louis joined the 100 Resilient Cities Initiative. Through this effort the City is working to build resilience with a focus on socio-economic factors, such as endemic crime and violence and civil unrest. This Climate Action & Adaptation Plan complements this effort, building environmental resilience resulting in socio-economic benefits, such as job creation, improved health and well-being.

Mean Daily Maximum Temperature For St. Louis



Temperatures are rising and will continue to rise through 2050. The amount of temperature increase will depend on the reduction of GHG emissions in the atmosphere. The Mean Daily Maximum Temperatures for St. Louis shows historical temperature increase in grey. The red line depicts a higher emissions scenario and the blue line represents a lower emissions scenario. Graph from <https://toolkit.climate.gov/>.

Mean Daily Average Precipitation For St. Louis



The Mean Daily Average Precipitation for St. Louis shows a seasonal average precipitation increase in 2050. The higher emissions scenario is in red and lower emissions scenario is in blue. Spring rainfall is predicted to increase the most. Graph from <https://toolkit.climate.gov/>.

Climate Hazards

The earth's climate is changing and the effects are being felt at the local level. Cities are vulnerable to climate change and the associated climate hazards they face, such as increased temperatures leading to heat stress, the number one killer in the United States.

The dangerous effects of climate change often hit hardest in low-income and African American communities.

Climate protection implementation poses an opportunity for integration of economic prosperity, social equity, and environmental protection. Improved public health and safety is the lead recommendation for the City's climate adaptation efforts, and is the focus of the strategies and actions outlined in the following section.

This Climate Action & Adaptation Plan supports resilience efforts by the 100 Resilient Cities Initiative by recommending triple bottom line strategies that result in socio-economic co-benefits to climate protection.

Climate adaptation implementation will help the community protect public health and safety through preparedness, and build climate resiliency to reduce the cost of damage from extreme weather. The City of St. Louis spends nearly half a million dollars per year to address flooding¹⁷; however, managing the City's vulnerabilities, such as flooding, can reduce this cost. If climate adaptation efforts are not pursued, public health and safety will be at risk, people's quality of life will diminish, and the costs of weather related damages will continue to rise.

The City of St. Louis is already experiencing the effects of climate change. The heat wave that hit the St. Louis area in 2012 saw temperatures rise above 100 degrees Fahrenheit for 10 consecutive days, resulting in 24 deaths due to extreme heat. In December 2015, a record-breaking flood swept through the area, causing extensive damage to property. These weather events will continue and increase in frequency and magnitude.

The Climate Adaptation section addresses high-level risks associated with climate change. Anticipating climate changes and being prepared for climate change consequences, will put the City in a better social, economic, and environmental situation. Further, there are actions that can be undertaken now to adapt to change both underway and likely to result. The City of St. Louis is likely to be affected by climate hazards resulting from temperature extremes, precipitation extremes, and severe weather/natural disaster events. Climate hazards are presented on page 17.



Riverfront multi-use path along flood wall

17. Kiekow, Anthony, St. Louis Prepares for Flooding along Riverfront, <http://fox2now.com/2015/06/16/st-louis-prepares-for-flooding-along-riverfront/>, date accessed: 20 January 2017.



The historic Wainwright Building on 7th Street Downtown



- Kennedy Woods Prairie in Forest Park

Table: Adaptation Goal Objectives, Strategies, and Actions Overview

OBJECTIVES	STRATEGIES & ACTIONS
1. Preserve & Enhance the Natural Environment	<p>1.1 Improve & Restore Natural Systems for Changed Conditions</p> <ul style="list-style-type: none"> Minimize removal of trees and landscape biomass Develop new urban forests and ecological restoration areas Use vacant land as stormwater management Continue to naturalize public and private landscapes Study the effects of climate change on plant and tree species & maintain an inventory of appropriate plant & tree species that can tolerate the altered climate Encourage restoration or reconstruction of wetlands for ground water recharge & discharge to reduce impact of droughts on rivers & streams Develop green waterways to restore natural systems
2. Protect Human Health & Safety	<p>2.1 Protect People from Temperature Extremes</p> <ul style="list-style-type: none"> Provide cooling / heating centers and utility assistance Educate vulnerable populations on health related risks of extreme hot and cold weather and where to find resources Increase mobility to cooling and heating centers <p>2.2 Create a Healthy & Cool Built Environment</p> <ul style="list-style-type: none"> Install cool roofs to cool the City Install vegetative roofs to green the City Increase the City's tree canopy to shade and cool the City Develop clean air strategies that benefit human health Evaluate and scale vector-borne disease programs as warranted and develop surveillance systems <p>2.3 Reduce Flood Impact & Risk</p> <ul style="list-style-type: none"> Educate residents on stormwater best management practices Relocate homes from flood prone areas Promote green infrastructure on residential and commercial properties to capture rainwater on-site Reduce water usage in buildings through water-saving techniques and low-flow fixture installations Develop a riverfront resilient to flooding Encourage restoration or reconstruction of wetland areas along all rivers and streams for purposes of flood control Protect vulnerable water treatment facilities by relocation, hardening, or other method Upgrade gray infrastructure to address sewer overflows
3. Maximize Preparedness Efforts	<p>3.1 Prepare for Natural Disaster</p> <ul style="list-style-type: none"> Provide storm shelters around the City that all populations have access to in times of severe weather Continually update emergency response procedures Upgrade to an Emergency Alert System (EAS) for notification of severe weather and other emergencies Evaluate building codes to address building resiliency Develop a Passive Survivability Plan



RELATIONSHIP TO EXISTING PLANS, PROGRAMS, AND INITIATIVES

RELATIONSHIP KEY	SUSTAINABILITY PLAN	PROGRAMS & INITIATIVES	CITY, REGIONAL, & OTHER PLANS
<ul style="list-style-type: none"> ● Direct Impact ○ Secondary Impact ○ Indirect Impact X Relationship to Plan 	Urban Character, Vitality & Ecology Arts, Culture & Innovation Empowerment, Diversity & Equity Health, Well-Being & Safety Infrastructure, Facilities & Transportation Education, Training & Leadership Prosperity, Opportunity & Empowerment	City Energy Project City of St. Louis Sustainable Neighborhood Initiative City of St. Louis Urban Vitality & Ecology Initiative St. Louis Green Business Challenge Energy Saving St. Louis (inactive) Mississippi River Cities & Towns Initiative MSD – Project Clear Project Connect Set the PACE St. Louis Ameren – Integrated Resource Plan (IRP) City of St. Louis P.I.E.R. Plan City of St. Louis Resiliency Plan (in development) City of St. Louis Sustainability Plan Community Health Improvement Plan (CHIP) Community Health Needs Assessment (CHA) EMS Report – Lambert-St. Louis International Airport Great Rivers Greenway District Gateway Bike Plan Missouri Comprehensive State Energy Plan MSD – Sanitary Sewer Overflow Control Master Plan OneSTL Regional Plan for Sustainable Development State of Missouri Technical Reference Manual St. Louis Regional Hazard Mitigation Plan St. Louis Regional YIIP Task Force Community Plan	
1. Preserve & Enhance the Natural Environment			
1.1 Improve & Restore Natural Systems for Changed Conditions	● ○ ○ ● ○ ○ ○	- X X - - X X X - - - X X X - X X - X X - - - X	

ADAPTATION OBJECTIVE 1

PRESERVE & ENHANCE THE NATURAL ENVIRONMENT

Many aspects of the natural environment are inherently designed to handle climate impacts. The prevalent disconnection from nature in cities will need to be reversed, with ecosystems restored, for climate resiliency. Many natural systems have been lost over time to development; wetlands drained and filled, streams and creeks covered with concrete culverts, and land covered by impervious surfaces. These development activities have led to increased heat island effects, loss of biodiversity and ecosystems, and flash flooding. The loss of the natural environment has exacerbated the City's vulnerabilities to climate change. The strategy and accompanying actions in this section are intended to guide efforts to restore, preserve, and enhance the natural environment to help the City adapt to climate change, and protect the population's health, safety, and well-being.



OBJECTIVE	STRATEGIES & ACTIONS
1. Preserve & Enhance the Natural Environment	<p>1.1 Improve & Restore Natural Systems for Changed Conditions</p> <ul style="list-style-type: none">• Minimize removal of trees and landscape biomass• Develop new urban forests and ecological restoration areas• Use vacant land as stormwater management• Continue to naturalize public and private landscapes• Study the effects of climate change on plant and tree species & maintain an inventory of appropriate plant & tree species that can tolerate the altered climate• Encourage restoration or reconstruction of wetlands for ground water recharge & discharge to reduce impact of droughts on rivers & streams• Develop green waterways to restore natural systems

Strategy 1.1: Improve & Restore Natural Systems for Changed Conditions

High functioning ecosystem services and natural systems can help the City adapt to climate change by reducing heat island effects, absorbing rain water, protecting soil quality, and improving air and water quality. The altered climate will have an impact on the natural environment in numerous ways, such as what grows, and thrives. The conservation and protection of natural systems and ecosystems is crucial for climate adaptation to prevent biodiversity loss and degradation of ecosystems. Restoring and preserving ecosystems will help reduce vulnerability and increase resilience to climate change. Examples include flood mitigation, pollination, water and air purification

Benefits: Urban natural systems serve as a valuable public amenity that can help increase environmental literacy, improve mental health and well-being, and is visually appealing.

Challenges: The cost of naturalizing the environment and the resources required to protect plants and trees from disease and insect infestation.



CROSS CUTTING OUTCOMES

- Social**
 - Education & training opportunities
 - Active living, health & well-being
 - Quality of life & neighborhood vitality
 - Social equity & cultural diversity
- Environmental**
 - Aesthetic / Beautification
 - Flood mitigation / Stormwater control
 - Heat island mitigation
 - Improved air quality
 - Improved water quality
 - Expanded tree canopy, green space & ecosystem services
 - Biodiversity & native species
 - Water conservation
- Economic**
 - Green job opportunities
 - Neighborhood Development or improvement
 - Local business innovation & Entrepreneurship
 - Reduced maintenance & repair costs

CITY OF ST. LOUIS LEADING BY EXAMPLE

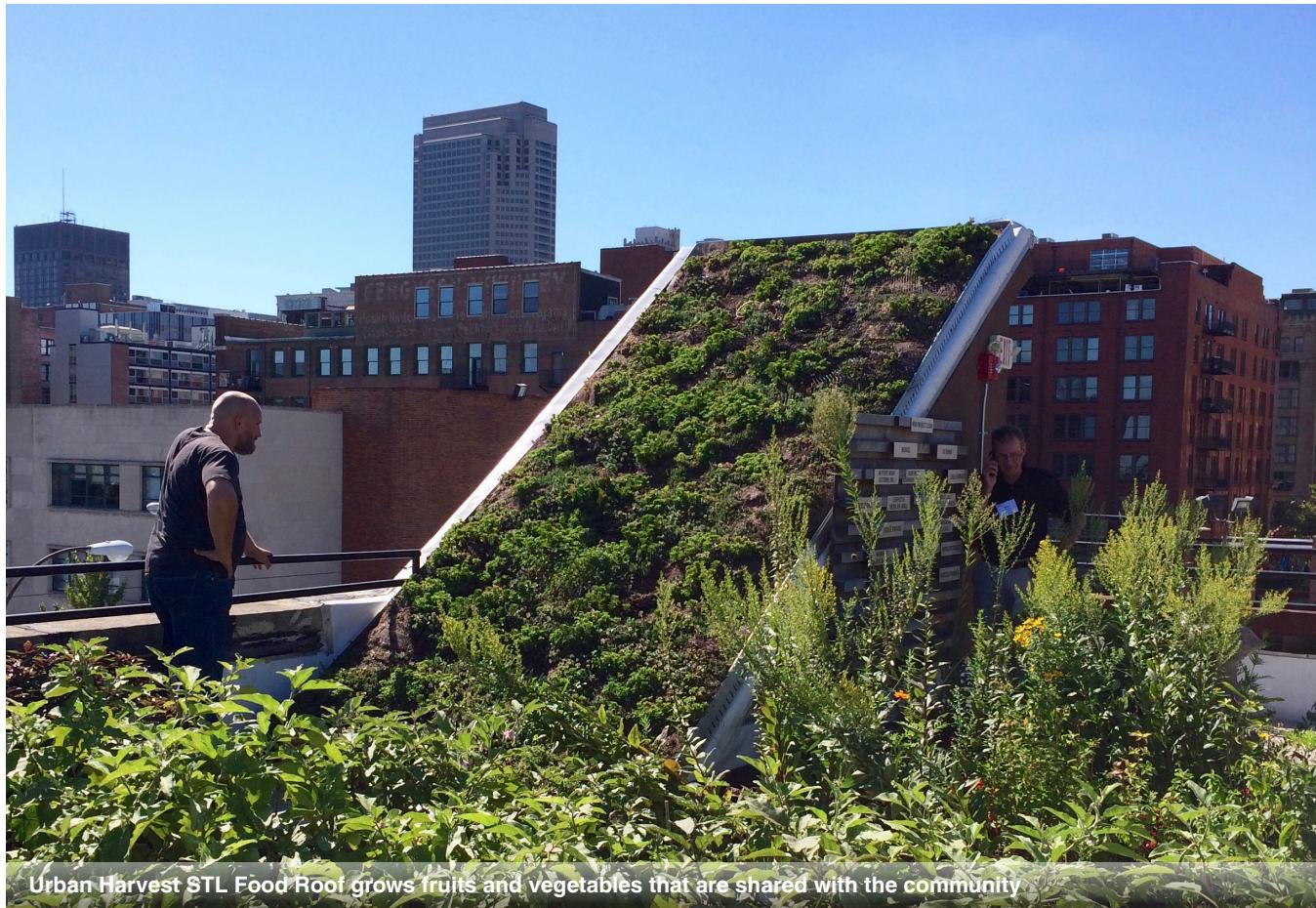
Parks, Recreation and Forestry Division

The City Forestry Division cares for thousands of trees in the City and has a No Net Loss Tree policy to maintain the City's urban canopy. For every tree that is removed, a new tree is planted. A GIS-based inventory is continually updated with information on street trees and park trees to help maintain the urban tree canopy and protect against diseases and insect infestations that could harm the trees. The City has 74,000 street trees and plants thousands of new trees every year. The City has received numerous awards for its urban forest being named a Sterling Tree City USA in 2005, the first City in Missouri to earn this honor, and receiving 14 Growth Awards in recognition of the Forestry Division's outstanding efforts and innovation.

STRATEGY 1.1

Improve & Restore Natural Systems for Changed Conditions

ACTIONS	
Minimize removal of trees and landscape biomass	Preserve landscape biomass to allow plants to function optimally in the changing environment. For example, the more biomass on a tree, the more shade it provides, water it absorbs, and carbon it sequesters. New planting efforts should plan for the full growth potential of trees and plants to minimize biomass removal due to man-made conflicts (i.e. power lines).
Develop new urban forests and ecological restoration areas	Support ongoing restoration efforts and increase urban forest planting for the purpose of rainwater absorption, improved air quality, increased biodiversity, and carbon sequestration. Improved and restored natural environments serve as social and economic community amenities as well.
Use vacant land as stormwater management	Convert a portion of vacant land into green infrastructure to decrease flash flooding and sewer overflows during heavy rain events, and help absorb rainwater and divert it from entering the sewer system.
Continue to naturalize public and private landscapes	Naturalize public and private landscapes to incorporate plant biodiversity (native and adapted) and natural processes. Naturalized landscapes can manage stormwater on-site through the use of permeable materials, ponds, and rainwater capture methods for reuse and create functioning ecosystems capable of providing food and shelter for animals and insects.
Study the effects of climate change on plant and tree species and maintain an inventory of appropriate (native and adapted) plant and tree species that can tolerate the altered climate	Plants and trees have some level of adaptive capacity to survive in changing climates; however, new plantings are more vulnerable and can become stressed due to extreme weather events. Continually monitor and study the effects of climate change on plants and trees to determine species best suited for the changing conditions in order to maintain a diversity of plant and tree types to be more resilient to climate change.
Encourage restoration or reconstruction of wetlands for ground water recharge and discharge to reduce impact of droughts on rivers and streams	Restore and reconstruct wetlands along all streams and rivers in St. Louis to serve as flood control and for ground water recharge and discharge to reduce impact of droughts on water levels. Wetland restoration and reconstruction projects should be encouraged and incorporated into future planning efforts along rivers, streams, and watersheds.
Develop green waterways to restore natural systems	Greening waterways protects water quality, increases biodiversity, help with ground water recharge, helps absorb rainwater, and improves the overall aesthetic of the City. Currently some waterways have been covered in concrete, which has diminished their inherent natural function.



RELATIONSHIP TO EXISTING PLANS, PROGRAMS, AND INITIATIVES

RELATIONSHIP KEY

- Direct Impact
- Secondary Impact
- Indirect Impact
- X Relationship to Plan

SUSTAINABILITY PLAN

Urban Character, Vitality & Ecology	Arts, Culture & Innovation	Empowerment, Diversity & Equity	Health, Well-Being & Safety	Infrastructure, Facilities & Transportation	Education, Training & Leadership	Prosperity, Opportunity & Empowerment

PROGRAMS & INITIATIVES

City Energy Project	City of St. Louis Sustainable Neighborhood Initiative	City of St. Louis Vitality & Ecology Initiative	St. Louis Green Business Challenge	Energy Saving St. Louis (inactive)	Mississippi River Cities & Towns Initiative	MSD – Project Clear
Project Connect	Set the PACE St. Louis	Ameren – Integrated Resource Plan (IRP)	City of St. Louis P.I.E.R. Plan	City of St. Louis Sustainability Plan (in development)	Community Health Improvement Plan (CHIP)	Community Health Needs Assessment (CHA)
		EMS Report – Lambert-St. Louis International Airport	Great Rivers Greenway District Gateway Bike Plan	Missouri Comprehensive State Energy Plan	MSD – Sanitary Sewer Overflow Control Master Plan	OneSTL Regional Plan for Sustainable Development
						State of Missouri Technical Reference Manual
						St. Louis Regional Hazard Mitigation Plan
						St. Louis Regional YVP Task Force Community Plan

CITY, REGIONAL, & OTHER PLANS

2. Protect Human Health & Safety

- 2.1 Protect People from Temperature Extremes
- 2.2 Create a Healthy & Cool Built Environment
- 2.3 Reduce Flood Impact & Risk

● Direct Impact ○ Secondary Impact ○ Indirect Impact X Relationship to Plan

ADAPTATION OBJECTIVE 2

PROTECT HUMAN HEALTH & SAFETY

It will be imperative to improve the built environment and ensure proper resources and programs are in place to protect residents from the impacts of climate change. Every person is affected by the health impacts of climate change; however, vulnerable populations including low-income people, young children, and the elderly face the greatest health and safety impacts. Climate change threatens our health by affecting the water we drink, the air we breathe, and the weather we experience. Mitigating heat and reducing flood risks will improve resiliency to climate change and reduce people's health and safety impacts. The strategies and actions in this section are intended to guide efforts to protect human health and safety related to climate change. Adapting to climate change will provide public health co-benefits, such as reduced loss of life, heat stress, and asthma cases exacerbated by air pollution.



Stan Musial Veterans Memorial bridge across the Mississippi River

OBJECTIVE	STRATEGIES & ACTIONS
2. Protect Human Health & Safety	<p>2.1 Protect People from Temperature Extremes</p> <ul style="list-style-type: none">Provide cooling / heating centers and utility assistanceEducate vulnerable populations on health related risks of extreme hot and cold weather and where to find resourcesIncrease mobility to cooling and heating centers <p>2.2 Create a Healthy & Cool Built Environment</p> <ul style="list-style-type: none">Install cool roofs to cool the CityInstall vegetative roofs to green the CityIncrease the City's tree canopy to shade and cool the CityDevelop clean air strategies that benefit human healthEvaluate and scale vector-borne disease programs as warranted and develop surveillance systems <p>2.3 Reduce Flood Impact & Risk</p> <ul style="list-style-type: none">Educate residents on stormwater best management practicesRelocate homes from flood prone areasPromote green infrastructure on residential and commercial properties to capture rainwater on-siteReduce water usage in buildings through water-saving techniques and low-flow fixture installationsDevelop a riverfront resilient to floodingEncourage restoration/reconstruction of wetland areas along rivers and streams for purposes of flood controlProtect vulnerable water treatment facilities by relocation, hardening, or other methodUpgrade gray infrastructure to address sewer overflows

Strategy 2.1: Protect People from Temperature Extremes

Temperature extremes can be fatal if effective resources and programs are not in place. People are vulnerable to health impacts of extreme heat/heat waves and extreme winter conditions/cold temperatures. Length, frequency, and intensity of heat waves are expected to increase over the next century. Temperatures over 90 degrees Fahrenheit increase ground-level ozone, a dangerous air pollutant, decreasing air quality and aggravating asthma and other respiratory conditions. Vulnerable populations must be educated on the dangerous health effects of temperature extremes. The City of St. Louis Department of Health, along with other partners, have played a key role in protecting vulnerable populations from temperature extremes.

Benefits: Reduced loss of life and protection of public health and safety.

Challenges: Staff and resources required to run programs.

CROSS CUTTING OUTCOMES



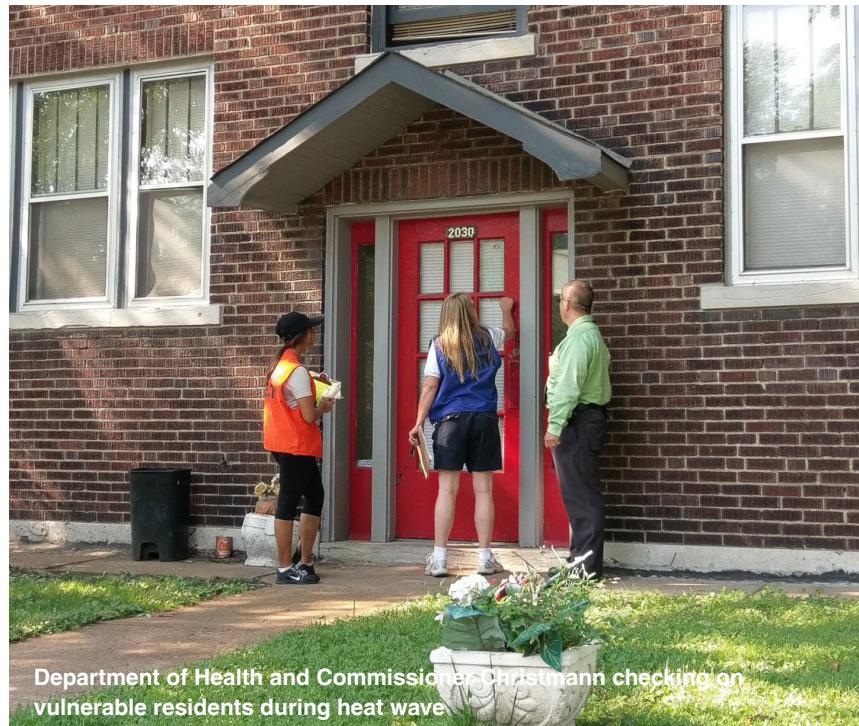
Social

- Mobility & access to transportation
- Education & training opportunities
- Active living, health & well-being
- Quality of life & neighborhood vitality
- Social equity & cultural diversity



Economic

- Neighborhood Development or improvement
- Land Use & Transportation Integration
- Reduced energy costs to tenants & building owners



Department of Health and Commissioner Christmann checking on vulnerable residents during heat wave

CITY OF ST. LOUIS LEADING BY EXAMPLE

Department of Health Heat Warning

The City of St. Louis Department of Health conducts outreach all year, but is particularly vigilant in times of extreme heat events and heat waves. The Department of Health utilizes the City of St. Louis Functional Needs Registry, a database of residents who may require assistance in the event of an emergency, and surveillance systems to monitor public safety during heat events. A voice message from the Mayor is sent to residents on the Functional Needs Registry, reminding them of resources, such as cooling centers and utility assistance. The Department of Health, along with staff from other City departments and groups, go door-to-door to check on vulnerable neighbors during heat events to ensure they are in a safe and cool environment that will protect their health and well-being.

Adaptation Objective 2: Protect Human Health & Safety

STRATEGY 2.1

Protect People from Temperature Extremes

ACTIONS

Provide cooling / heating centers and utility assistance

Continue to provide cooling and heating centers through the Cool Down/Heat Up St. Louis program to protect human health and safety during extreme hot and cold temperatures. Provide utility assistance to encourage heating and cooling systems to be turned on to protect people's health and safety during extreme temperature events. The Annual Heat-Up Winterizing forum engages city and county residents to provide utility assistance and learn about utility rights, energy efficiency, and financial literacy.

Educate vulnerable populations on health related risks of extreme hot and cold weather and where to find resources

Extreme hot and cold temperatures impact human health and well-being. Educate vulnerable populations of temperature-related health risks and provide tips for staying safe in extreme temperature events. Make resources readily available in multiple forms (i.e. television and radio broadcasts, mailed information, VoiceShot auto messaging, and emails). The Department of Health for the City of St. Louis maintains a Functional Needs Registry of vulnerable populations that should be used in this effort.

Increase mobility to cooling and heating centers

Transportation systems are vital for access to resources and services within the City. Ensure convenient and equitable access to cooling and heating centers for all populations through multiple forms of transportation.



Department of Health staff with Commissioner Christmann checking on vulnerable residents during heat wave

Strategy 2.2: Create a Healthy & Cool Built Environment

Temperatures are going to increase to some extent due to climate change already underway. Heat island mitigation measures can be pursued to cool the City and improve quality of life. The number of hot days is going to increase, and planting trees and installing cool and green roofs will make the environment more comfortable. Both the natural and built environment should be improved to better manage and adapt to heat. Rising temperatures can increase the season and geographic range of disease carrying insects.

Benefits: Reduce heat island effects, protect human health, and make more comfortable and stable indoor environments.

Challenges: Offsetting the loss of trees due to the Emerald Ash Borer while trying to increase tree canopy in the City.



CITY OF ST. LOUIS LEADING BY EXAMPLE

Sustainable Neighborhood Initiative Small Grant Program

In 2013, as part of its Sustainable Neighborhood Initiative, the City conducted a Sustainable Neighborhood Small Grant Competition. Neighborhood organizations and groups had the opportunity to propose projects that would help improve livability and enhance quality of life in their own communities. A project to pilot Cool Roof installations in the Forest Park Southeast Neighborhood, called Painting Sustainability, was one of seven small grant recipients. This project trained residents and volunteers to paint roofs with a reflective white coating. On average, the cool roofs helped the homes achieve lowered roof temperatures to within 4 degrees Fahrenheit of ambient temperatures.

CROSS CUTTING OUTCOMES

Social

- Education & training opportunities
- Food access and nutrition
- Active living, health & well-being
- Quality of life & neighborhood vitality
- Social equity & cultural diversity

Environmental

- Aesthetic / Beautification
- Flood mitigation / Stormwater control
- Heat island mitigation
- Improved air quality
- Improved water quality
- Expanded tree canopy, green space & ecosystem services
- Biodiversity & native species

Economic

- Home or building investment
- Neighborhood Development or improvement
- Reduced energy costs to tenants & building owners
- Reduced maintenance & repair costs
- Technology and innovation opportunities

STRATEGY 2.2

Create a Healthy & Cool Built Environment

ACTIONS

Install cool roofs to cool the City

Cool roofs absorb less heat from the sun and keep buildings cooler. Installation of cool roofs can help maintain cooler, more constant indoor temperatures, allowing air conditioning systems to work less. Cool roofs reduce contribution to the urban heat island effect in the community.

Install vegetative roofs to green the city

Green roofs improve building energy efficiency by providing shade and insulation to maintain a more consistent and comfortable indoor environment. Additionally, green roofs add aesthetic to the City and can help reduce peak stormwater runoff and potentially grow food.

Increase the City's tree canopy to shade and cool the City

Ensure sufficient tree canopy in all areas of the City to provide shade along streets, sidewalks, trails, and in public parks and open spaces. Encourage private tree planting to help increase the City's overall tree canopy. Increase tree planting efforts in low income areas to help reduce the heat island effect, shade buildings and sidewalks, and provide a valuable public amenity.

Develop clean air strategies that benefit human health

Develop strategies to reduce identified causes of air pollution and create a strategic plan for reductions. Coal-burning power plants and vehicle emissions are two primary contributors to the City's poor air quality, leading to an increase in cases of asthma and respiratory conditions. (See mitigation section)

Evaluate and scale vector-borne disease programs as warranted and develop surveillance systems

The Department of Health for the City of St. Louis monitors the threat of emerging vectors and diseases. As climate change progresses, these surveillance efforts and systems may need to be scaled up, as warranted, to protect the health and well-being of the community.



Forest Park

Strategy 2.3: Reduce Flood Impact & Risk

Heavy precipitation events are going to increase in frequency and intensity. The City of St. Louis is prone to river flooding because of its location near the confluence of the Mississippi and Missouri Rivers. Flash flooding is the result of large amounts of paved, impervious surface which increases stormwater runoff into the combined wastewater and stormwater sewer system. The City of St. Louis spends nearly half a million dollars per year to address flooding.¹⁸

Benefits: Restoring natural systems to manage stormwater will help reduce the impact and risk of flooding to protect people and their property and reduce the cost of flood damage.

Challenges: The combined wastewater and stormwater sewer system is not currently sized to handle stormwater runoff and the cost to upgrade this infrastructure is very high.



CROSS CUTTING OUTCOMES

Social

- Education & training opportunities
- Active living, health & well-being
- Quality of life & neighborhood vitality
- Social equity & cultural diversity

Environmental

- Aesthetic / Beautification
- Flood mitigation / Stormwater control
- Improved air quality
- Improved water quality
- Expanded tree canopy, green space & ecosystem services
- Biodiversity & native species
- Water conservation

Economic

- Green job opportunities
- Home or building investment
- Neighborhood Development or improvement
- Local business innovation & Entrepreneurship
- Reduced maintenance & repair costs
- Technology and innovation opportunities

CITY OF ST. LOUIS LEADING BY EXAMPLE

Urban Vitality & Ecology Initiative Stormwater Management

Through the Urban Vitality & Ecology Initiative, the City Planning and Urban Design Agency (PDA) has been working with community partners to convert vacant lots to community amenities that also manage stormwater. The City has partnered with MSD Project Clear to fund green infrastructure projects and provide demolition support to reduce the impacts of flooding on residents and businesses. Through Brightside St. Louis, the City is creating a St. Louis Riverfront Butterfly Byway, as a pollinator pathway along the riverfront and floodplain areas. This Byway will serve as an opportunity for residents to interact with nature to improve environmental literacy, health and well-being, and community cohesion.

18. Kiekow, Anthony, St. Louis Prepares for Flooding along Riverfront, <http://fox2now.com/2015/06/16/st-louis-prepares-for-flooding-along-riverfront/>, date accessed: 20 January 2017.

STRATEGY 2.3

Reduce Flood Impact & Risk

ACTIONS	
<i>Educate residents on stormwater best management practices</i>	Collect rain on-site through stormwater disconnects to reduce the amount of rain entering the wastewater system. Basement backups and sewer overflows can result from an overcharged sewer system during heavy rain events. MSD, through Project Clear, is working in specific project areas to remove stormwater connections at no cost to customers.
<i>Relocate homes from flood prone areas</i>	Support the Cityshed Mitigation efforts to relocate homes in low-lying areas that experience unpreventable recurring system surcharges, causing basement backups and overland flooding. The program helps homeowners relocate by property purchase and relocation.
<i>Promote green infrastructure on residential and commercial properties to capture rainwater on-site</i>	Encourage implementation of green infrastructure on residential and commercial properties to reduce stormwater runoff into sewer systems through rainwater capture and absorption on-site. MSD's Project Clear Rainscaping program offers small and large scale grants to residential and commercial properties to manage stormwater through rainscaping efforts.
<i>Reduce water usage in buildings through water-saving techniques and low-flow fixture installations</i>	Conserve potable water usage in buildings by installing low-flow fixtures as part of a drought management plan. Although the City of St. Louis is located near the confluence of two major rivers, water is a limited resource that should be protected and conserved to avoid shortages in the future.
<i>Develop a riverfront resilient to flooding</i>	Improve riverfront resiliency to flooding through the use of stormwater management best practices. Implement flood absorption techniques in lieu of building more floodwalls.
<i>Encourage restoration or reconstruction of wetland areas along all rivers and streams for purposes of flood control</i>	Restore and reconstruct wetlands along all streams and rivers in the City to serve as flood control through rainwater absorption. Absorbing flood waters protects water quality by reducing sewer overflows into rivers and streams.
<i>Protect vulnerable water treatment facilities by relocation, hardening, or other method</i>	The City of St. Louis Water Division maintains two water treatment plants. Assess vulnerabilities to flooding and work to protect essential equipment to maintain performance during and after flood events. Evaluate vulnerabilities to determine if relocation or hardening is required.
<i>Upgrade gray infrastructure to address sewer overflows</i>	The City of St. Louis is served by a combined, wastewater and rainwater, sewer system that becomes overcharged and overflows during rainfall due to the amount of impervious surfaces. Consider plans to update gray infrastructure in collaboration with Project Clear.



RELATIONSHIP TO EXISTING PLANS, PROGRAMS, AND INITIATIVES

RELATIONSHIP KEY	SUSTAINABILITY PLAN	PROGRAMS & INITIATIVES	CITY, REGIONAL, & OTHER PLANS
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3. Maximize Preparedness Efforts			
3.1 Prepare for Natural Disaster	○ ○ ○ ● ○ ○ ○ ○ ○	- - - - - - - - - -	X - X X - - - - - X X - X -

ADAPTATION OBJECTIVE 3

MAXIMIZE PREPAREDNESS EFFORTS

Severe weather events can happen at any time, and are predicted to increase in frequency and magnitude due to climate change. To keep the public safe and be resilient to extreme weather and natural disaster events, preparedness efforts, including notification systems, plans, and procedures, must be in place and continually updated. The actions outlined in this section are intended to guide preparedness efforts to protect public health, well-being and safety in times of extreme weather events.



Airport vehicle that runs on CNG fuel

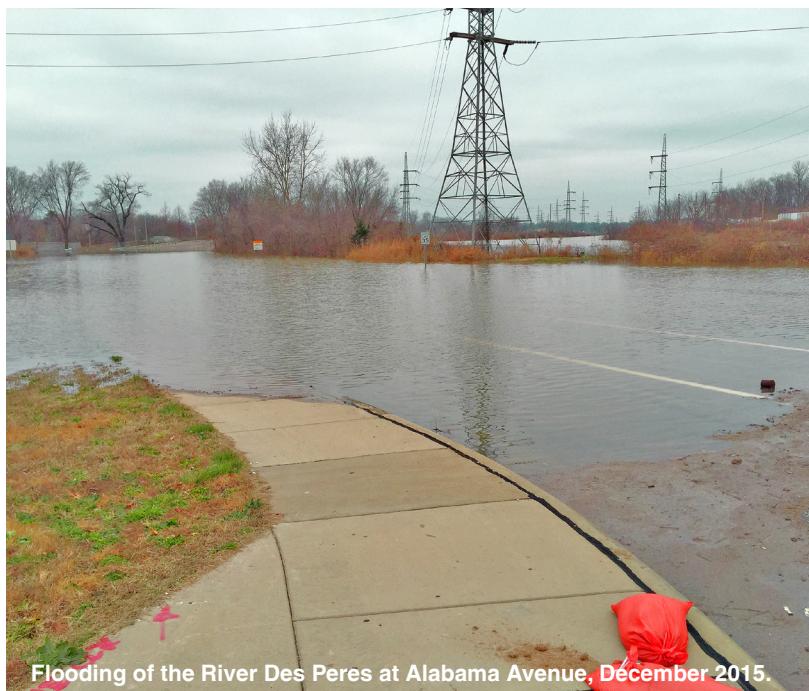
OBJECTIVE	STRATEGIES & ACTIONS
3. Maximize Preparedness Efforts	<p>3.1 Prepare for Natural Disaster</p> <ul style="list-style-type: none">Provide storm shelters around the City that all populations have access to in times of severe weatherContinually update emergency response proceduresUpgrade to an Emergency Alert System (EAS) for notification of severe weather and other emergenciesEvaluate building codes to address building resiliencyDevelop a Passive Survivability Plan

Strategy 3.1: Prepare for Natural Disaster

The City of St. Louis is prone to tornadoes and earthquakes. These natural disasters cannot be anticipated with specificity, but can cause damage to property and put people at risk. Extreme weather events –such as heat waves, flooding, and ice/snow storms– although slightly more predictable, pose risks to property, health and safety. Preparedness efforts and response plans for natural disasters are key to keep people safe.

Benefits: Public health, well-being, and safety during severe weather.

Challenges: Minimal response time for tornadoes and earthquakes.



CROSS CUTTING OUTCOMES

Social

- Education & training opportunities
- Active living, health & well-being
- Crime reduction & safety improvements
- Quality of life & neighborhood vitality
- Social equity & cultural diversity

Economic

- Home or building investment
- Neighborhood Development or improvement
- Local business innovation & Entrepreneurship
- Reduced maintenance & repair costs
- Technology and innovation opportunities



STRATEGY 3.1

Prepare for Natural Disaster

ACTIONS	
<i>Provide storm shelters around the City that all populations have access to in times of severe weather</i>	Develop a network of public storm shelters around the City that all populations have quick, equitable, and convenient access to in times of severe weather and natural disasters. FEMA funds can be used to construct safe rooms. Public amenities such as schools, hospitals, libraries, government buildings, and others should include safe rooms for public use.
<i>Continually update emergency response procedures</i>	Prepare for emergencies and natural disaster events by continually updating response procedures. The City should continue to update emergency response procedures informed by the hazard vulnerability analysis. Encourage the community to plan in advance for emergencies and disasters. Provide resource information to residents, businesses, and institutions to aid in development of individual emergency response plans.
<i>Upgrade to an Emergency Alert System (EAS) for notification of severe weather and other emergencies</i>	Upgrade from outdated outdoor warning sirens to a modern Emergency Alert System (typically used for notification of Amber Alerts) to get messages out to the public of severe weather and other emergency events in a timely manner.
<i>Evaluate building codes to address building resiliency</i>	Expand the regulatory scope of building codes to address and improve building resiliency due to extreme weather and natural disaster. Consider incorporating passive survivability into building code amendments.
<i>Develop a Passive Survivability Plan</i>	Establish strategies to be considered for design and construction of passive survivability concepts for buildings to be resilient in extreme human-made and natural disaster events. Passive Survivability refers to the ability of a building to maintain critical life-support conditions for its occupants if services such as power, heating fuel, or water are lost for an extended period of time.

Credits, Acknowledgments and Review Period



Sunflower+Project: STL

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CITY OF ST. LOUIS STAFF & DEPARTMENTS

- Affordable Housing Commission
- Board of Public Service - Equipment Services, Facilities Management and Planning
- City Emergency Management Agency
- City of St. Louis Public Utilities - Water Division
- Department of Health
- Department of Parks, Recreation & Forestry
- Department of Public Safety - Building Division
- Department of Streets, Lights & Refuse - Traffic Division
- Office of Sustainability
- Planning and Urban Design Agency
- St. Louis Development Corporation
- St. Louis Lambert International Airport

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COMMUNITY TECHNICAL EXPERT REVIEW TEAM

- Ameren Missouri
- Butterfly Energy Works
- East West Gateway Council of Governments,
- Eastern Missouri Group of Missouri Sierra Club
- Mississippi River Cities & Towns Initiative
- Missouri Botanical Garden
- Missouri Coalition for the Environment
- Sitton Energy Solutions
- Spire Energy/Laclede Gas Group
- St. Louis Regional Chamber
- U.S. Green Building Council Missouri Gateway Chapter,
- Washington University in St. Louis



Paddle boats in Forest Park

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CONSULTANT TEAM

The City's consultants during the climate action and adaptation planning process were:

- H3 Studio: John Hoal, Julia Dicus, Tim Breihan, Jovanni Carter-Davis, and Laura Broun
- Rene Dulle

IMAGE CREDITS

Images used in this document are courtesy of Ameren, the City of St. Louis, Julie DeGraaf, H3 Studio, STL Emergency Management Agency, St. Louis Lambert International Airport, Sheila Voss and Catherine Werner.

REVIEW SCHEDULE

The Climate Action and Adaptation Plan for the City of St. Louis Sustainability Plan is a living document that will be reviewed at five year intervals by the City's Planning and Urban Design Agency.

